UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF ANIMAL INDUSTRY
ANIMAL HUSBANDRY DIVISION

CONFERENCE
ON
THE NATIONAL POULTRY IMPROVEMENT PLAN
IN
CHICAGO, ILL.

May 24 - 28, 1937.

The papers presented herein were delivered at the Conference on the National Poultry Improvement Plan held in Chicago, Ill., May 24-28, 1937, under the auspices of the United States Department of Agriculture. The conference was called for the purpose of considering problems in the administration and operation of the plan, fundamental breeding and pullorum-disease-control problems, and proposed revisions in the National Poultry Improvement Plan in the light of experience to date. In keeping with the resolution adopted at the conference the papers are hereby made available to the industry through the facilities of the United States Department of Agriculture. The publication and distribution of this Conference report should not be construed, however, as implying Department concurrence with all views expressed.

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OFFICIAL STATE REPRESENTATIVES IN ATTENDANCE

State	Represented by:
Kansas	M. A. Seaton, Kansas Poultry Improvement Assn., Manhattan, Kans.
Kentucky	J. Holmes Martin, Kentucky Poultry Improvement Assn., Lexington, Ky.
Louisiana	Clyde Ingram, Louisiana Poultry Improvement Assn., Baton Rouge, La.
Maryland	Paul A. Raper, Maryland Poultry Certification Board, College Park, Md.
Massachusetts	Howard Whelan, Department of Agriculture, State House, Boston, Mass.
Michigan	J. M. Moore, Michigan Poultry Improvement Assn., East Lansing, Mich.
Minnesota	W. K. Dyer, Minnesota Poultry Improvement Board, St. Paul, Minn.
Mississippi	J. D. Sykes, Mississippi Poultry Improvement Assn., State College, Miss.
Missouri	E. M. Funk, Missouri Poultry Improvement Committee, Columbia, Mo.
Nebraska	J. H. Claybaugh, Nebraska Poultry Improvement Assn., Lincoln, Nebr.
New Hampshire	R. C. Bradley, Poultry Dept., University of New Hampshire, Durham, N. H.
New Jersey	Leon Todd, Bureau of Markets, Dept. of Agriculture, Trenton, N. J.

OFFICIAL STATE REPRESENTATIVES IN ATTENDANCE

State	Represented by:
New Mexico	W. M. Ginn, New Mexico State Poultry Association, State College, New Mex.
New York	Walter H. Schait, New York State Cooperative Official Poultry Breeders, Inc., Ithaca, N. Y.
North Carolina	H. S. Wilfong, Department of Agriculture, Raleigh, N. C.
North Dakota	Frank E. Moore, North Dakota Poultry Improvement Board, Fargo, N. Dak.
Ohio	G. S. Vickers, Ohio Poultry Improvement Association, Columbus, Ohio.
Oklahoma	L. E. McConkey, Oklahoma Poultry Improvement Association, Mehan, Okla.
Oregon	F. L. Knowlton, Agricultural Experiment Station, Corvallis, Oreg.
Rhode Island	Ralph A. Farrow, Department of Agriculture & Conservation, Providence, R. I.
South Carolina	P. H. Gooding, S. C. Poultry Improvement Supervisory Board, Clemson, S. C.
South Dakota	M. H. Simonson, S. D. Poultry Improvement Association, Brookings, S. D.
Texas	A. H. Demke, Texas Baby Chick Association, Stephenville, Texas.
Utah	Carl Frischknecht, Utah Poultry Improvement Committee, Logan, Utah.

OFFICIAL STATE REPRESENTATIVES IN ATTENDANCE

State	Represented by:
Virginia	H. L. Moore, Secretary, Virginia R.O.P. Assn., Blacksburg, Va.
Washington	J. W. Kalkus, Washington Poultry Improvement Association, Puyallup, Wash.
West Virginia	H. K. Rowley, State Poultry Improvement Committee of West Virginia, Morgantown, W. Va.
Wisconsin	C. Howard King, Department of Agriculture and Markets, Madison, Wis.
Wyoming	C. N. Summers, Wyoming Poultry Breeders & Improvement Assn., Laramie, Wyo.

OTHER STATE REPRESENTATIVES IN ATTENDANCE

Alabama	W. B. Collier, Poultry Inspector, Dept. of Agriculture and Industries, Montgomery, Ala. K. B. Ellis, Poultry Inspector, Dept. of Agriculture and Industries, Montgomery, Ala. John Ivey, Extension Poultryman, Auburn, Ala. W. S. Pollard, Poultry Inspector, Dept. of Agriculture and Industries, Montgomery, Ala.
Arizona	G. S. Stover, President, Arizona Poultry Improvement Assn., Tucson, Ariz.
Arkansas	S. A. Moore, Poultry Specialist, Fayetteville, Ark.
Georgia	Arthur F. Gannon, Extension Poultryman, Athens, Ga.

OTHER STATE REPRESENTATIVES IN ATTENDANCE

State	Represented by:
Illinois	H. H. Alp, Specialist in Poultry Husbandry, Urbana, Ill.
	L. E. Card, Professor and Chief of Poultry Husbandry, University of Illinois, Urbana, Ill.
	H.C. Helm, Hatchery Operator, President, Illinois Baby Chick Association, Metropolis, Ill.
	Theodore Hendricks, Poultryman, Lisle, Ill.
	J. E. Price, Poultryman, Yorkville, Ill.
	H. C. Rinehart, Chief Veterinarian, Department of Agriculture, Springfield, Ill.
	Walter Swanson, Poultry Breeder, Elmhurst, Ill.
Kentucky	E. A. Baute, Field Manager, Kentucky Poultry Improvement Assn., Lexington, Ky.
	D. D. Slade, Hatchery Operator, President, Kentucky Baby Chick Assn., Director, Kentucky Poultry Improvement Assn., Lexington, Ky.
Maryland	M. A. Jull, Head of Poultry Dept., University of Maryland, College Park, Md.
	W. H. Rice, Poultry Specialist, College Park, Md.
Massachusetts	E. B. Parmenter, Poultry Breeder, President Massachusetts, R. O. P. Breeders Assn., Inc., Franklin, Mass.

OTHER STATE REPRESENTATIVES IN ATTENDANCE

State	Represented by:
Michigan	Ray Connolly, Official State Inspector, East Lansing, Mich.
	Arthur J. Hannah, Poultry Breeder, President, Michigan R.O.P. Assn., Grand Rapids, Mich.
	Rex Holland, Poultry Breeder, Hamilton, Mich.
	A. G. Lohman, Hamilton County Farm Bureau, Hamilton, Mich.
	Arthur D. Morley, County Agent, Allegan, Mich.
	O. E. Shear, Poultry Specialist, East Lansing, Mich.
	E. S. Weisner, Poultry Specialist, East Lansing, Mich.
Missouri	A. J. Durant, Chairman, Department of Veterinary Science, University of Missouri, Columbia, Mo.
	H. C. McDougle, Research Assistant in Veterinary Science, University of Missouri, Columbia, Mo.
	C. E. Rohde, Extension Assistant, Professor Poultry Husbandry, University of Missouri, Columbia, Mo.
	Frank Wright, Official State Inspector, Columbia, Mo.
New Hampshire	Grant Jasper, President, New Hampshire Poultry Growers Assn., Hudson, N. H.
	E. W. Lang, Chief Inspector and Blood Collector, Department of Agriculture, Concord, N. H.
	C. L. Martin, Assistant Professor of Veterinary Science, University of New Hampshire, Durham, N. H.

OTHER STATE REPRESENTATIVES IN ATTENDANCE

State	Represented by:
New York	L. E. Weaver, Extension Assistant Professor of Poultry Husbandry, Cornell University, Ithaca, N.Y.
North Dakota	T. O. Brandenburg, Executive Secretary, Livestock Sanitary Board, Bismarck, N. D.
Ohio	E. W. Roberts, State Laboratories, Department of Agriculture, Reynoldsburg, Ohio.
	T. M. Valentine, President, Ohio Poultry Improvement Association, Tiffin, Ohio.
Oklahoma	F. Z. Beanblossom, Field Manager, Oklahoma Poultry Improvement Assn., Stillwater, Okla.
	T. D. Brown, President, Oklahoma R.O.P. Assn., Tulsa, Okla.
Oregon	Morris Christensen, President, Oregon Poultry Improvement Assn., McCoy, Ore.
Texas	D. H. Reid, Head and Professor of Poultry Husbandry, Texas A. & M. College, College Station, Tex.
Utah	W. O. Ramshaw, Hatchery Operator, President, Utah Hatcher's and Breeder's Aasn., Salt Lake City, Utah.
Virginia	Hollis Shomo, Poultry Specialist, Division of Markets, Richmond, Va.
Washington	L. C. Beall, President, Washington Poultry Improvement Assn., Vashon, Wash.
West Virginia	J. Karl Bletner, Official State Inspector, Morgantown, W. Va.
	E. T. Wightman, Assistant Professor and Assistant Poultry Husbandman, West Virginia University, Morgantown, W. Va.

"AT LARGE" GROUP IN ATTENDANCE

Joe Bumgarner, Associate Editor, Poultry Supply Dealer, Chicago, Ill.
C. D. Carpenter, Lederle Laboratories, New York, N. Y.
A. A. Dennerlein, Quaker Oats Company, Chicago, Ill.
I. V. Edgerton, Palace Poultry Car Company, Chicago, Ill.
J. J. Ferguson, Swift and Company, Chicago, Ill.
Harold Florea, Associate Editor, Poultry Tribune, Mt. Morris, Ill.
Kirk Fox,Editor, Successful Farming, Des Moines, Iowa.
H. E. Gordon, Vice President, International Baby Chick Association, Marion, Iowa.
L. P. Graham, Chicago, Ill.
Miss Florence Halverson, Public Relations Department, Priebe and Sons, Chicago, Ill.
O. A. Hanke, Editor, Poultry Tribune, Mt. Morris, Ill.
Ralston R. Hannas, Editor, American Poultry Journal, Chicago, Ill.
L. H. Harvey, Brown Advertising Agency, Chicago, Ill.
E. B. Heaton, Manager, Institute of American Poultry Industries, Chicago, Ill.
Reese V. Hicks, Executive Secretary, International Baby Chick Association, Kansas City, Mo.
L. M. Klevay, Associate Editor, American Poultry Journal, Chicago, Ill.
Roy Lynnes, Editor, Poultry Supply Dealer, Chicago, Ill.
Paul Mandeville, Editor, Institute of American Poultry Industries, Chicago, Ill.
Hiram Merriman, Roberts Evert Company, New York, N. Y.
L. G. Neal, Hales and Hunter Company, Chicago, Ill.
R. C. Ogle, President American Record of Performance Council, Ithaca, N. Y.
F. C. Plinston, Secretary-Treasurer, U.S. Record of Performance Federation,Ithaca,N
James E. Rice, President, Northeastern Poultry Producers Council, Trumansburg, N.Y.
F. M. Simpson, Swift and Company, Chicago, Ill.
G. F. Stewart, In Charge of Research in Poultry and Dairy Products, Omaha Cold Storage Company, Omaha, Nebr.
L. S. Tenney, Business Manager, Chicago Mercantile Exchange, Chicago, Ill.
W. C. Tully, Sunset Feed and Grain Company, c/o Chamber of Commerce, Buffalo, N. Y.
C. N. Whittaker, President, U. S. Record of Performance Federation, Lawrence, Mich.

U. S. DEPARTMENT OF AGRICULTURE REPRESENTATIVES IN ATTENDANCE

Hubert Bunyea, Veterinarian, Bureau of Animal Industry.
Melvin W. Buster, Poultry Husbandman, Bureau of Animal Industry.
T. C. Byerly, Senior Physiologist, Bureau of Animal Industry.
W. A. Hendricks, Assistant Poultry Husbandman, Bureau of Animal Industry.
J. E. Humphrey, Poultry Husbandman, Bureau of Animal Industry.
C. W. Knox, Senior Poultry Geneticist, Bureau of Animal Industry.
Stanley Marsden, Associate Poultry Husbandman, Bureau of Animal Industry.
J. M. Schaffer, Senior Chemist, Bureau of Animal Industry.
T. G. Shearman, Senior Attorney, Solicitor's Office.
H. L. Shrader, Senior Extension Poultry Husbandman, Agricultural Extension Service.
W. D. Termohlen, Chief, Poultry Section, Agricultural Adjustment Administration.
Berley Winton, Senior Poultry Husbandman, Bureau of Animal Industry.
Paul B. Zumbro, Senior Poultry Coordinator, Bureau of Animal Industry.

STANDING COMMITTEE ON RECORD FORMS

J. W. Kalkus, Western Washington Experiment Station, Puyallup, Wash. (Chairman)
R. B. Jones, Department of Agriculture and Industries, Montgomery, Ala.
Roy E. Jones, Connecticut State College, Storrs, Conn.
J. M. Moore, Michigan State College, East Lansing, Mich.
M. A. Seaton, Kansas State College of Agriculture, Manhattan, Kans.
Berley Winton, Bureau of Animal Industry, U.S.D.A., Washington, D. C. (ex officio)
Paul B. Zumbro, Bureau of Animal Industry, U. S. D. A., Washington, D. C. (ex officio)

EXTENT OF PARTICIPATION IN THE NATIONAL POULTRY IMPROVEMENT PLAN

Year ending June 30, 1937

By J. E. Humphrey

Participation during the second year of operation included:

1. A total of 1,239 hatcheries with a hatching capacity of 52,591,786 eggs.
2. Thirty-one States with 301 U. S. Record-of-Performance flocks in which 112,202 birds were trap-nested.
3. A total of 1,675 U. S. Record-of-Performance breeding pens which contained 22,322 qualified females.
4. Forty-one States engaged in one or more phases of the work.

Tabulation of breeder and commercial hatchery participation:

Breeding stage and pullorum-control class	No. States	Breeder and commercial hatcheries		Breeding flocks	
		Number	Egg capacity	No. flocks	No. breeders
U. S. Approved	13	411	20,939,523	11,660	2,070,976
U. S. Approved, Pullorum-Tested	26	524	24,568,398	16,441	2,789,792
U. S. Approved, Pullorum-Passed	3	12	52,200	17	16,260
U. S. Approved, Pullorum-Clean	3	21	74,416	23	26,101
TOTAL, U. S. APPROVED STAGE	31	968	45,634,537	28,141	4,903,129
U. S. Certified	6	54	1,953,956	538	237,198
U. S. Certified, Pullorum-Tested	15	60	1,425,419	342	148,752
U. S. Certified, Pullorum-Passed	3	24	151,200	36	209,987
U. S. Certified, Pullorum-Clean	8	35	964,746	65	91,069
TOTAL, U. S. CERTIFIED STAGE	23	173	4,495,321	981	687,006
U. S. Pullorum-Tested	6	35	1,047,104	741	112,507
U. S. Pullorum-Passed	4	38	1,189,100	399	387,494
U. S. Pullorum-Clean	4	25	225,724	296	435,771
TOTAL, PULLORUM CONTROL ONLY	8	98	2,461,928	1,436	945,772
TOTALS	38	1,239	52,591,786	30,558	6,535,907

State	No. hatcheries in U. S. July 1, 1934	Tabulation of breeder and commercial hatchery participation by States, 1936-37			
		Hatcheries		Breeding flocks	
		Number	Egg capacity	Number	Number birds
Alabama	80	45	898,673	850	129,084
Arizona	25	19	512,912	221	44,161
Arkansas	62	15	389,648	371	54,153
Colorado	105	13	525,000	445	80,233
Florida	79	27	273,800	133	26,493
Georgia	102	24	445,794	131	36,599
Idaho	62	22	643,584	287	66,706
Illinois	600	174	10,496,890	8,155	1,333,477
Indiana	609	2	150,000	2	18,980
Iowa	757	48	3,473,665	2,394	460,024
Kansas	595	114	4,545,640	2,445	449,668
Kentucky	89	31	1,763,952	1,516	159,178
Louisiana	34	5	110,000	79	46,075
Maryland	131	5	96,000	65	18,780
Massachusetts	319	35	687,630	265	405,739
Michigan	444	33	1,591,000	806	189,660
Minnesota	458	67	3,118,624	1,231	300,890
Mississippi	62	17	566,976	554	67,263
Missouri	572	22	1,261,320	970	137,957
Nebraska	330	4	202,000	69	11,873
New Hampshire	145	70	1,363,000	401	666,743
New Jersey	224	37	1,031,252	105	58,597
New Mexico	16	3	89,000	85	10,136
North Carolina	104	67	1,751,055	926	173,802
North Dakota	50	7	464,000	221	24,932
Ohio	831	66	4,586,908	3,015	576,165
Oklahoma	237	41	1,358,780	1,127	155,603
Oregon	214	5	118,900	5	12,645
Rhode Island	37	18	231,800	49	41,955
South Carolina	66	8	255,460	213	27,057
South Dakota	124	17	1,203,600	538	88,037
Texas	603	25	1,987,295	371	71,925
Utah	41	16	1,130,240	230	84,596
Virginia	179	4	108,128	4	2,584
Washington	240	25	812,670	118	78,790
West Virginia	49	20	429,100	405	59,569
Wisconsin	473	88	3,917,490	1,714	362,174
Wyoming	8	--	--	42	3,604
Totals	9,156	1,239	52,591,786	30,558	6,535,907

Tabulation of record-of-performance participation:

Breeding stage and pullorum-control class	No. States	No. entered in U.S.R.O.P.			Breeding pens	
		Breeders	Flocks	Birds	No. pens	No. females
U. S. R. O. P.	10	98	112	33,425	533	7,661
U. S. R. O. P., Pullorum-Tested	22	135	163	50,100	579	7,768
U. S. R. O. P., Pullorum-Passed	8	15	15	2,880	31	308
U. S. R. O. P., Pullorum-Clean	11	53	62	25,797	532	6,585
TOTAL, U. S. R. O. P. STAGE	31	301	352	112,202	1,675	22,322

Tabulation of record of performance participation by States:

State	No. breeders	No. flocks	No. birds entered in trap-nest flock	U.S.R.O.P. breeding pens	
				No. pens	No. females
Alabama	11	13	3,310	11	104
Arizona	7	7	481	23	178
Colorado	1	1	600	4	68
Connecticut	9	13	4,398	101	1,046
Delaware	3	3	1,258	15	143
Georgia	6	6	2,309	8	63
Idaho	2	2	1,576	25	329
Indiana	11	13	5,527	89	1,059
Kansas	20	20	5,144	67	839
Kentucky	6	7	1,902	11	91
Maryland	2	4	660	7	29
Massachusetts	18	20	8,277	217	2,648
Michigan	14	17	7,857	168	2,147
Minnesota	9	14	5,166	95	1,964
Mississippi	1	4	800	29	367
Missouri	16	23	5,138	60	678
New Hampshire	9	9	2,150	47	527
New Jersey	17	20	3,701	57	657
New York	24	28	5,757	142	1,849
North Carolina	11	13	3,719	2	--
North Dakota	2	2	527	--	--
Ohio	14	15	6,403	68	1,119
Oklahoma	13	17	3,186	14	215
Oregon	10	11	11,100	51	811
Rhode Island	2	2	322	10	97
Texas	8	9	3,251	35	372
Utah	9	12	2,502	34	529
Virginia	8	8	2,584	21	195
Washington	15	15	4,687	159	2,327
West Virginia	8	10	2,964	19	169
Wisconsin	12	14	4,946	86	1,702
Totals	301	352	112,202	1,675	22,322

THE CONFERENCE GETS UNDER WAY

By Berley Winton, senior poultry husbandman,
Bureau of Animal Industry,
U.S. Department of Agriculture.

A year ago tomorrow we held the first conference of duly designated official State representatives on the National Poultry Improvement Plan. Since that time our family has increased by seven States so that we have at present 41 States represented here at this, the second conference on the national plan.

For those of you who have never had the experience of preparing for such a conference I want to say for the benefit of our Federal coordinators that the task is not so simple as it might appear. In the first place funds must be available and formal approval for holding the conference obtained from the Secretary of Agriculture. In the second place a mass of detailed, routine work is involved in getting the State appointments through and in making arrangements for transportation to and from the conference. In the third place the program has to be prepared and speakers obtained and finally the conference has to be held, after which the various papers are mimeographed and distributed. I can testify to the fact that the Federal coordinators have worked faithfully in arranging for this conference.

We are indeed pleased to have 41 States represented. We are encouraged to have so many visitors present. If we continue to hold an annual conference we hope to make it so important that an increasing number of breeders and hatcherymen will attend. To my knowledge no poultry conference has been held, heretofore, in the United States with so many States represented in an official capacity.

Last year many of us became acquainted. We learned something of each other's problems and how important questions in poultry improvement were handled in the different States. We want to become better acquainted and to know more of the work of each other as a result of holding this year's conference.

We have arranged a program which we hope will give us additional information on which we may base our future activity. I am confident that, if we will discuss frankly our mutual problems, we will have profited by holding this conference.

Those of us from the Federal Department of Agriculture are eager to receive such suggestions and recommendations as you may have to offer on how the National Poultry Improvement Plan can serve most effectively the poultry industry of the United States. Subject-matter information, proposed changes, State and Federal administration, and bringing about compliance with the provisions of the national plan will and should be discussed thoroughly and sympathetically during this conference.

To those of you who are visitors we want you to know we shall welcome any suggestions you may have to offer during the conference. We shall be pleased to have you take part in the deliberations of this conference.

Of course you appreciate the fact that under the circumstances when the time comes for us to consider the proposed changes in the plan, only official State representatives can represent the States participating in the plan but you may feel free to discuss the questions under consideration.

We solicit your cooperation in making this a most worthwhile conference. We hope you will have a pleasant and profitable time here during the next few days. If those of us from the U.S. Department of Agriculture can make your stay more pleasant do not hesitate to contact us.

THE SECOND YEAR AND THE FUTURE OF THE NATIONAL POULTRY IMPROVEMENT PLAN

By: Paul B. Zumbro, senior poultry coordinator,
Bureau of Animal Industry,
U. S. Department of Agriculture.

The continued success of the National Poultry Improvement Plan is dependent upon the individual efforts and close cooperation of three groups, namely, participating industry members, including poultry breeders, hatcherymen, and flock owners; the official State agencies; and the Federal Bureau of Animal Industry. All three of these groups, industry members, official State agencies, and the Federal Government, have reasons to be pleased with the progress which has been made during less than two years' time in which the plan has been in operation. But we are interested in making it more worth while.

During the second year we have seen seven additional States adopt the plan; namely, Delaware, Idaho, Indiana, Louisiana, Minnesota, New York, and North Carolina. In addition to these new States, there has been a substantial increase in the extent of participation in practically every State that was engaged in the work last year. Breeders and hatcherymen are now participating in the U.S. Approved breeding stage in 31 States, an increase of five over last year, and in the U.S. Certified breeding stage in 23 States, an increase of nine over last year. The greatest expansion in the breeding phase of the plan has taken place in the two most advanced breeding stages. Thirty-one States are now engaged in U.S. Record-of-Performance work and these breeders in eight States have birds qualified as Register of Merit. In most instances the breeding phase of the plan is carried on simultaneously with the pullorum-control phase and altogether there are 34 States in which official testing for pullorum disease is being done.

Breeders and hatcherymen in 41 States are now participating in one or more phases of the national plan. More than 1,239 breeder and commercial hatcheries with a hatching egg capacity of more than 52 million eggs participated in the plan during the current year. This represents 10.3 percent of the hatcheries and 17.5 percent of the entire hatching-egg capacity in the United States. There are 173 U.S. Certified hatcheries with a combined hatching-egg capacity of more than 4½ million eggs. It requires 981 U.S. Certified flocks, consisting of more than 687,000 birds, to supply hatching eggs to these hatcheries.

We now have in this country 301 breeders trap-nesting 112,202 birds under U.S. Record-of-Performance supervision. On these farms there are 1,675 U.S.R.O.P. breeding pens or single-male matings. When we consider the fact that there are 22,322 qualified U.S.R.O.P. females in these breeding pens and that each female is capable of producing a minimum of seven qualified U.S.R.O.P. males, we can begin to see the potential possibilities of using this superior breeding stock in improving the production qualities of a great mass of our chickens. This potential supply of 156,254 U.S.R.O.P. males could sire 45 to 60 million chicks or 5 to 7½ percent of our entire supply of hatchery chicks.

More extensive participation this year indicates increased confidence on the part of the industry in the value of the plan. There are a number of other accomplishments of great importance. We all have an improved understanding of the provisions of the plan, its aims, and its possibilities. This has been accomplished through experience in administrating and participating in the plan, and as we gain in experience, we will be in better position to make the most effective use of this plan.

Unquestionably there has been an improvement in the administration of the plan in each State as a result of the experiences of the State poultry officials during the past two years. The degree of improvement in this respect varies among the States but in most has been appreciable. This improvement has been brought about as a result of close observation of the work of the plan and having been able to recognize its weaknesses and its strong points. There has been a general recognition of the fact that the official State agency should include a representation of participating members of the industry, as well as representatives of each of the various State agencies that have responsibility in connection with the administration of the plan.

In States where poultry improvement associations serve as the official State agency, the administration of the plan has been strengthened by appointing representatives from the State college of agriculture and State department of agriculture on the governing board. In one State the poultry improvement board was composed entirely of State officials, which did not prove so satisfactory. Arrangements have been made to have four industry members selected by the participating breeders and hatcherymen serve on the board. In another State improved administration has resulted from the creation of a poultry improvement board, consisting of two participating industry members, two representatives of the college of agriculture, and two from the State department of agriculture, to serve as the official State agency in place of the poultry improvement association which in this particular State was a trade organization and had only a passive interest in poultry improvement work.

We have many types of agencies which are recognized as official State agencies and this matter is dependent largely upon past experience within the State in carrying on poultry improvement work. In 20 States the State poultry improvement association is delegated with the responsibility of administering the plan, and in 10 States the official State agency consists of a poultry improvement board or committee. In 10 of the 11 remaining States the official State agency is a State institution such as the poultry division, bureau of markets, or livestock sanitary board of the State department of agriculture. In 1 State the agricultural experiment station of the State college of agriculture serves in this capacity.

In connection with having members of the industry and all the State officials who are concerned with the work represented in the official State agency, we believe it is desirable to have an industry committee serve in an advisory capacity when the official State agency consists of a State institution. The use of such a committee will bring about a more thorough understanding of the program, more intelligent and enthusiastic cooperation, and at the same time keep the administration of the plan on a practicable basis. These comments are made to illustrate our conclusions from observation that the most successful administrative boards are those composed of participating members and representatives of the various State agencies and organizations which are actively interested in the improvement of the poultry industry.

There now exists an increased understanding of the problems of poultry improvement work in the various States and a greater desire on the part of the States to cooperate in working out the most satisfactory plan of poultry improvement for benefiting the entire industry, rather than that of one State to the disadvantage of others. This recognition of the value of cooperating to develop a broad national program comes as a result of working together and of having national conferences such as this in which we have an opportunity of discussing our common problems in the light of the needs of the entire industry. We hope it will be possible to have these conferences each year for the purpose of developing more uniform and efficient methods of putting the plan into operation. In future conferences, it seems likely that less time will need to be devoted to making changes in the plan itself and more to the consideration of ways and means of improving its administration and operation.

The function and relationship of the Federal Government in the administration of the plan is better understood as a result of our experience of working together. The primary purposes of the Federal Government are (1) to assist the cooperating States in the administration of the plan, (2) to advise with those engaged in the work regarding improved methods of breeding and pullorum control, and (3) to coordinate the work among the various States and assist the State agencies in administering the program in an efficient manner. It is not our purpose or duty to check upon and discipline industry members directly in regard to compliance with the provisions of the plan. Our position in this respect can probably best be illustrated by an experience which I had during the early days of the plan. An official State inspector asked me if a hatcheryman would be permitted to sell U.S. Approved chicks if his breeding birds were not banded with official sealed and numbered leg bands. I replied that the plan would not permit this practice. The official inspector asked me if I would dictate a letter to the hatcheryman to that effect, and I said, "No, but I will, if necessary, dictate a letter to you stating that it will not be permissible for a hatchery operating under your supervision to sell U.S. Approved chicks if his birds are not properly leg banded." Our contact with the industry member is always through the official State agency.

At last year's conference a national committee on record forms was selected. As you know, this committee has been in session during the greater part of the last three days. Mr. Beall was good enough to sit in with this committee, and he contributed many valuable suggestions toward making the forms practicable and workable from the standpoint of the breeder and hatcheryman. The purpose of this committee is to consider the forms that are being used in various States and to work out forms that could be used by all of the official State agencies. A great deal of good is being accomplished by this committee and I know you will be looking forward to hearing Dr. Kalkus' report on Wednesday morning. At the meeting of this committee during the International Baby Chick Association convention at Kansas City last summer, it was recommended that the Bureau design an emblem which could be used by all participating members. This was done and the emblem has been used widely in many of the States. The National Poultry Improvement Plan emblem offers additional protection to those who are engaged in the work of the plan because it is reserved for the exclusive use of those who are qualified to sell products of U.S. breeding stages and pullorum-control classes. It also has considerable educational and advertising value.

An examination of the display of official chick box labels at this conference as compared with a similar display which we had here last year will show that considerable progress has been made in the way of developing attractive labels that define the breeding stage and pullorum-control class of baby chicks and hatching eggs. Many of the States have changed their labels to include the National Poultry Improvement Plan emblem. We anticipate that all the States will have attractive official labels by next season. In our opinion, the adoption of more uniformity in the design and color of labels would be desirable. This is a matter which should be considered by the committee on record forms.

With the splendid cooperation of official State agencies, breeders and hatcherymen, and the Agricultural Extnesion Service, a three-reel sound motion picture was produced during the past year and is now available in both 16-millimeter and 35-millimeter sizes. You will have an opportunity to see and hear this picture tomorrow evening.

The national turkey improvement committee which was appointed here last year has been active in contacting turkey breeders and poultry departments of the agricultural colleges and developing a turkey improvement plan which can serve as a guide until such time as turkeys may be included as a part of the National Poultry Improvement Plan.

We do not have complete information on turkey improvement work in the various States, but we do know that such work is already under way in the States of Arizona, Kentucky, Texas, Michigan, and Kansas. The National Poultry Improvement Plan provides the machinery for administering a turkey improvement program and if there is sufficient demand on the part of official State agencies and industry members this work can be included as a section of the national plan.

What we have already said about the accomplishments of the participating industry members, official State agencies, and the Federal Government in this work during the past year will serve to illustrate the good that can be done by all of us working together toward a common goal, but there are many problems that present themselves for solution. One of the most important problems is that we have a vast waste of superior breeding stock. Numerous instances have come to our attention of U.S.R.O.P. breeders destroying thousands of male chicks from U.S.R.O.P. hens or selling cockerels from these chicks as broilers, while hundreds of flocks supplying eggs to hatcheries were mated to males of inferior breeding, being selected only on the basis of external characters. We saw on one U.S.R.O.P. Rhode Island Red breeding farm in the East 1,500 individually pedigreed cockerels from U.S.R.O.P. breeding pens that were to be sold at the live poultry auction market.

In one of the western States one U.S.R.O.P. Leghorn breeder and U.S. Certified hatcheryman, having 2,300 pullets under U.S.R.O.P. supervision and 1,200 qualified U.S.R.O.P. females in flock matings, segregated at least 90 percent of his chicks according to sex. Male chicks were offered for sale at 2 cents each and there were very few sales. Also a large percentage of the cockerels brooded on his own farm were sold as market poultry. In the same State it is estimated that not more than 30 percent of the Leghorn chicks produced are sired by pedigreed males.

If chick buyers and hatcherymen had a better appreciation of the value of males from U.S.R.O.P. stock, these males would be purchased at a price which would enable the U.S.R.O.P. breeder to produce them at a profit and at the same time the general quality of hatchery chicks would be improved.

There have been many examples which indicate that breeders, hatcherymen, and their flock owners do not fully understand and appreciate their responsibilities and opportunities as far as participation in the plan is concerned. The plan provides a vehicle for giving recognition and protection in the adoption of improved methods of breeding and pullorum-disease control.

It should not be considered primarily as a sales program but rather regarded as a means by which the breeders and hatcherymen may produce stock of better quality and merit recognition for so doing. Industry members must always be aware of the fact that "high-powered" names such as "U.S. Approved" and "U.S. Certified" will not sell chicks if they are not of good quality. Products that are produced under the terminology of the national plan should always be worthy of the name.

In certain States there is lack of sufficient funds for properly conducting the work. For the most part the industry members who are cooperating in the plan are paying for the cost of supervision through hatchery and flock fees. In some instances State funds are available to be used in assisting the industry members in taking care of the cost. It is not possible to have a good program without sufficient funds to carry on the necessary inspection and educational work properly, and if State funds are not available, a practical system of financing the work should be adopted.

Official State agencies are learning the importance of having flock-selecting and pullorum-testing agents properly trained so that they may do an efficient and thorough job. In some States the college of agriculture requires each applicant for a flock-selecting and pullorum-testing permit to take a two- to four-day course of training each year. There is a difference of opinion as to whether or not these agents should be required to take a course of training each year, but it is generally believed desirable to have them successfully pass an examination at least twice before they are given a permanent permit and that they should be required to return at least every two or three years for further training. Permits to do this work should not be issued to other than those who are actually going to do the work of selecting and testing the birds that are being qualified for the national plan. Otherwise, a person who has a permit and yet is not under any supervision may abuse the use of it by stating that he is qualified to select and test flocks according to the provisions of the plan.

Some of the certified selecting and testing agents are regularly employed as salesmen for various poultry supplies. We strongly question the advisability of permitting flock-selecting and pullorum-testing agents, who are also serving as salesmen for poultry feed and supply firms, to solicit orders for poultry feed and supplies from participating flock owners and hatcherymen whom they contact in connection with their activities in the national plan.

It is the responsibility of official State agencies to inspect and approve the advertising of breeders and hatcherymen who are operating under the provisions of the plan. We must constantly keep in mind that the plan is intended to benefit the purchaser of chicks as well as the producer. Numerous examples have been brought to our attention to illustrate that the advertising of participating industry members should be more carefully supervised. In one case a U.S. Approved hatcheryman was advertising U.S. Approved and U.S. Certified chicks of the save variety. In another, a U.S.R.O.P. breeder was advertising Register of Merit and U.S. Pullorum-Clean when he was not qualified for either. We hope that the cooperating State agencies can gradually develop a more efficient method of supervising advertising.

One of the responsibilities of official State agencies is that of assisting cooperating members of the industry to obtain hatching eggs and breeding stock that meet the requirements of the breeding stage or pullorum-control class in which they are participating. In at least two States provision has been made for the incubation and wing banding of U.S.R.O.P. chicks at the State college of agriculture. These States are in an area where U.S.R.O.P. chicks are not available, and this service makes it possible for hatcherymen, who desire, to qualify their flocks as U.S. Certified. It is important in the successful operation of the plan to have a dead-line date on which applications for participation are accepted and also to have a list of the breeders and hatcherymen who are participating in the plan published at an early date. In some States where the administration of the plan is most successful no applications are accepted after October 1, and lists of the cooperating industry members are published not later than January 1. In one of the far western States a flock owner wanted to have eggs from another State custom-hatched in a U.S. Pullorum-Tested hatchery. He obtained a letter from the person from whom these eggs were purchased stating that they were U.S. Approved, Pullorum-Tested. When the official list of hatcheries and flock owners became available it was learned that this flock was not qualified to produce U.S. Pullorum-Tested eggs. As a result it was necessary for the State inspector to have the eggs removed from the incubators, thus causing a loss to the seller of the value of the eggs and the cost of incubating them. This could have been avoided had the official list been published at an earlier date.

From our observation we believe that it is highly desirable to have the breeding and pullorum-control phases of the plan carried on simultaneously. It is questionable whether we can justify spending money testing breeders for pullorum disease when they have not been carefully selected for egg production and standard qualities. Similarly, birds which meet the requirements for the breeding stages should be tested for pullorum disease in order to control the loss among baby chicks.

The number of breeding stages and pullorum control classes in which industry members are participating varies considerably among the different States. In Nebraska and South Dakota only the U.S. Approved breeding stage has been adopted, while only the Record of Performance stage is being carried on in Delware, New York, and Virginia. There is a definite place for all of the breeding stages in each one of the 41 States that have adopted the plan, and it is hoped that during the coming year the program will be made more extensive in many of the States.

Some States say that they are not gaining much through cooperating in the National Poultry Improvement Plan. It is possible that this feeling may result from not having the proper facilities for administering the plan within the State and from not taking advantage of the help which it should be possible to obtain from cooperating with the other States.

The Federal administration of the plan has been no different than the other two links in this chain which must work together for successful operation. For example, in many cases we have not been able to contact the States at the most desirable time. In this connection it is hoped that eventually Mr. Buster, Mr. Humphrey, and I can work out schedules for our contact visits far enough in advance so that we will get into the States at the proper time, and will not be asking you to change your dates to accommodate us. However, we hope you will thoroughly appreciate and assist with this problem so that we may contact the States according to existing transportation schedules. We have not been in position to respond to all of the requests for attending training schools or annual meetings of poultry improvement associations.

The lack of an efficient and uniform system of records necessary to the administration of the plan has been another stumbling block, but this matter is being taken thoroughly into consideration by the national committee on record forms.

During the coming year we hope it will be possible to develop some additional educational material which may be used to teach prospective buyers the importance and value of the standards for the production of chicks of various breeding stages and pullorum-control clasees, and also to familiarize more thoroughly those who are participating in the plan with its provisions. In addition, we hope to prepare a one-reel silent motion picture which can be used more extensively than the three-reel sound picture which is now available. At the present time we are working on an exhibit which will be used at State fairs.

In spite of certain problems which have arisen in connection with the work of the national plan, it cannot be denied that considerable progress has been made. It is evident that the members of the industry in the various States can develop a more effective program of poultry improvement by cooperating with each other than by working independently. With the continued cooperation of all of the members of the industry, of all State agencies engaged in poultry improvement work, and of the Federal Government, we should, as time goes on, realize even greater benefits from this program.

APPLICATION OF THE REGISTER OF MERIT BREEDING STAGE

By Arthur J. Hannah, poultry breeder, president, Michigan R.O.P.
Association, Grand Rapids, Mich.

Considerable progress can be made at a meeting of this kind through an interchange of ideas. I consider it a distinct privilege to be able to participate in this program and am very happy to be here.

Register of Merit breeding is something quite new. It is a very broad subject and perhaps it would be well to lead up to it and then proceed from that point. I hope that through a discussion of Register of Merit we will be able to focus attention on this type of breeding.

The same fundamental principles that apply to plant or animal breeding apply to poultry breeding. Inasmuch as we are primarily interested in poultry, it is well to limit ourselves to that subject.

For centuries poultry breeding has been haphazard and along different lines than we are now following. Most of us can remember the breeding work that was being done twenty-five or more years ago. Then, all of our thoughts and energies were devoted to the perfecting of exhibition chickens, paying considerable attention to type and feather, color and markings, and producing birds primarily for show or exhibition purposes. This work was useful. Through it new varieties were created and old ones were improved--giving us the material from which the best commercial varieties of today have been evolved.

Early Leghorn breeders were much interested in show qualities and in emphasizing those points that were of importance when breeding for exhibition purposes. No thought at all was given to breeding from the utility standpoint. Mr. Tancred and others, through the use of trap nets, focused attention on breeding Leghorns for egg production. In a comparatively short length of time there were developed birds of relatively high egg production. Exhibition standards were still adhered to, and little or no attention was paid to egg size.

"More and larger eggs" has been a slogan in this country now for some time. It was largely through the efforts of college poultrymen and egg laying contest officials that egg size as well as number of eggs was given serious attention, and it was probably through their influence that Leghorn breeders, and other breeders as well, started stressing egg size in their poultry breeding programs.

Record of Performance work, I believe, started originally in Canada. In 1926, Michigan organized its first R.O.P. association. Similar associations were formed at about the same time in other States. Because of the rigid requirements of R.O.P. work, it was necessary for most breeders to eliminate, at once, many families because of the small-egg-size factor. It was no effort to produce birds that would lay 200 or more eggs per year, but to produce that number averaging two ounces or more was something quite different. It was found that those birds that came through and met the R.O.P. requirements were somewhat larger individuals and we were immediately impressed with the fact that body size must be kept constantly in mind in all our future breeding work. Along about the same time we became egg-quality conscious and realized that, along with number of eggs and egg size, egg shape, egg color, and shell texture were important factors to consider in our breeding program and that since these factors were inherited we would have to keep them constantly in mind. I believe that we were among the pioneers in giving some thought to interior egg quality. We did not know a great deal about the inheritance of egg quality but we felt and still feel that at least to a certain extent the thickness of the white, the toughness of the yolk membrane and other interior qualities are inherited. Because of this belief we have never lost sight of it in our breeding work.

The function of any breeder carrying on a worth while breeding program is to produce stock for his future use and to produce stock for sale. His logical customers are other breeders and commercial hatcherymen. If he is to continue his operations he must be able to offer his clients breeding stock that can be used to advantage. This means that he must make the best possible use of all the known factors that are desirable and must keep in mind those qualities and make every effort in his breeding work to make them dominant in his strain of birds.

Most of the better "poultry breeders", and there are only a very few good poultry breeders, have a definite breeding program that is kept constantly in mind. Their programs are based on: Egg production, egg size and egg quality; hatchability, livability, and longevity; reasonable body type, bird size, freeness from standard defects; or various combinations of these factors.

At least 12 years ago we became convinced that much the most important of these qualities was livability and longevity. We have stressed these qualities in all of our sales literature. We know that certain families and strains inherit a definite resistance to most diseases, and any sensible program must be based on the premise that chickens to be kept for a profit, under ordinary management, and under ordinary conditions, must be able to live well and lay well. Hens under good flock conditions that can lay well over a period of years have in their make-up something that individuals lack that fall by the wayside. In my opinion, at least, life-time performance--production in second and later years--is of more importance in a poultry breeding program than the first year's production. A breeding program in which all the females are trapped as long as they are retained or remain on the breeder's premises means considerable added expense - but in the long run through proper use of these individuals it will more than pay. There are not a great many 1,000-egg hens in the country. We have produced more than 50 such individuals and their records demonstrate livability and longevity. These females made these records under normal good conditions, under normal good management, and on good rations. They continued to live and lay while others under identical conditions passed on. These hens came through various epidemics, showing an inherited resistance built up through a survival-of-the-fittest breeding program.

Unfortunately, in my opinion, many breeders have sacrificed years of work in becoming unduly alarmed over various poultry diseases. Let us consider for a moment range paralysis. While range paralysis probably is not inherited, we are convinced that there is a very definite inherited resistance to it. Our plant was one of the first poultry plants in the Middle West to have a serious epidemic of range paralysis. Prior to 1925 we had lost as high as 50 percent of our birds in one year. Rather than become completely discouraged we bred from the survivors - those individuals that demonstrated their ability to come through under the same conditions under which the others could not survive. We have been rewarded in that, since 1927, we have not had a single case of true range paralysis on our farms. Bronchitis made its first appearance in Michigan, I believe, on our farm. We have never vaccinated against it but bred from those survivors that continued to make good production records. We undoubtedly have had some bronchitis on our plant each year. However we can not trace any serious losses to it. It is our thought that our breeding program has built an unusual resistance to it. I do not believe that we have escaped any of the various disease problems that have caused so much young-stock loss and adult mortality. Our survival-of-the-fittest program--breeding for livability and longevity--has made it possible for us to continue, and in continuing we have a much stronger strain of Leghorns to work with.

Breeding for resistance, retaining and using only those birds that live and lay well, offers the greatest hope that appears on the horizon today to combat laying "house" or adult mortality. In recent weeks there has been considerable discussion of adult mortality. There is no reason for great alarm or excitement. Losses have been averaging, in laying contests, about 20 percent; mortality on farms has been running as high as 30 percent, and in some cases 50 percent. The limiting factor in poultry profits for many years has been adult mortality. We have known considerable about nutrition, feeding, housing, and management for some time. From my observation most losses have gone undiagnosed or are attributed to leukemia, big liver, visceral gout, etc. Now it is quite possible that nutrition may have something to do with these losses. Management and housing probably account for some losses, but it is our belief that breeding is responsible for a considerable percentage of this mortality. Breeding from long-lived individuals, and from long-lived families of reasonably good production averages, in my opinion, is going to be the solution of the mortality problem.

After all, in any intelligent breeding program, families are more important than individuals. The plant breeder observes the average of all the progeny. Uniformity of quality is generally the determining factor. In the dairy industry, dairymen have long since learned that high individual records mean nothing, but that high average family production means a very great deal. The dairy herd associations have worked out indexes for measuring family quality. A bull is not highly regarded until a sufficient number of his daughters have come into production to indicate his breeding quality through their performance. A herd sire with a few outstanding daughters and some ordinary daughters is just an ordinary sire, but the herd sire whose daughters are uniformally good is highly regarded. The principles that apply to breeding for milk production, quantity, and quality, are essentially the same as those principles that apply to poultry breeding.

Several years ago in the Leghorn business we had progressed as far as was possible by using the breeding methods then in practice. Improvement beyond that point could come only through intelligent work on a family basis. Poultrymen are not family minded. Hatcherymen and farmers still emphasize 300-eggers as a mark of high quality. Register of Merit or R.O.M. is the first recognition that we have given to poultry breeding on a family basis. Production breeders and R.O.P. breeders have very frequently been disappointed with the progeny of individual males carrying fancy pedigrees. A pedigree tells very little. A long line of records in the ancestry may mean almost nothing. I should rather have a male from a 240-egg hen with a large number of daughters that average to lay more than their mother, than a male from a 300-egg hen with nondescript daughters. We have been watching families for 15 years. During the early part of this period, however, we followed the practice of emphasizing high records. Today, we consider all females with records above 240 eggs together; 240 eggs or 20 eggs a month for 12 months, indicates very satisfactory production. Variations above that depend upon many factors other than inheritance, such as date of hatching, the quality of the growing range, weather, the moving of individuals from one pen to another, etc..

Mr. Parmenter is going to discuss R.O.P. breeding and its application and I have no desire to encroach on his field. A discussion of Register of Merit Breeding must be a discussion of poultry breeding in general and of R.O.P. work in particular.

The time has come when the leaders of this industry and particularly the men in the colleges, must place much more emphasis on family breeding, progeny testing, or Register of Merit work, for after all they are all the same thing.

During the past 15 years we have trap-nested many thousands of Leghorns, trap-nesting them as long as the birds remained on our farm. There is a very great deal that we do not know, but we are learning some things. We think that we know something about the qualities that are important in good Leghorns. We know that we are making progress in developing a strain and many families in that strain that contain these qualities to a very high degree. We have had to forget high individual records because they deterred progress.

After all these years, we are convinced that the finest hen that we have ever owned, the one that is doing more for us than any other individual, is one that laid only 241 eggs in her first laying year, but that came from a family that was remarkable for its livability. Her dam laid 1,120 eggs in eight years. Her dam's dam laid 1,052 eggs. In the second laying year of the hen that we are now discussing, and this of course was her first pedigree year, we set 62 eggs and from them 60 chicks hatched. The next year, her second pedigree year, as a three year old, we set 99 eggs and hatched 87 chicks. The next year 65 eggs and hatched 52 chicks. This year we set 62 eggs from which we have hatched 51 chicks, or in four production years, not counting her first year under trap-nest, 288 eggs were set in incubators and 250 chicks were hatched. Because of her comparatively low record only five daughters were housed in 1934, five daughters qualified for R.O.P. approval with an average record of 250 eggs even. In the next laying year 17 daughters were housed, 16 qualifying for R.O.P. approval with an average production of 261 eggs. Her daughters this year are doing equally well. The daughters of her first sons are making outstanding records.

In using this hen as an example it can easily be seen how much more a cockerel from such a hen is worth than a cockerel from a 330-egg hen with an excellent pedigree but with no family record.

During the present breeding season we have used two Register of Merit pedigreed matings, each mating consisting of ten R.O.M. females mated to a male which met the requirements for Record of Merit breeding. A hen to qualify for Record of Merit must be an R.O.P. female out of an R.O.M. mating, which when mated to an R.O.P. or R.O.M. male, has at least one-third of her daughters entered in R.O.P. qualify for R.O.P. with a minimum of four that qualify. A Register of Merit male is an R.O.P. male out of an R.O.P. or R.O.M. mating, which when mated to R.O.P. or R.O.M. females has at least one-third of his daughters entered in R.O.P. qualify for R.O.P. with a minimum of 20 that qualify. There has been no particular public interest in this grade because neither the public, nor the hatcherymen, nor the poultrymen appreciate the importance of family breeding. There is much that could be said on this subject and I have only scratched the surface.

I hope to leave with you only one thought for your consideration and that is through trap-nesting and pedigree breeding on an individual basis we can not get very far. Only through intelligent progeny testing and breeding on the basis of family performance, can we make real progress.

The future of the entire poultry breeding program requires a great deal of attention to it and I hope that through Record of Merit breeding, with the cooperation of the leaders of the industry, and particularly of the college poultrymen, we may be able to undo some of the harm that has been done through over emphasis of high individual records. Today, Register of Merit means very little. If we are to progress - tomorrow it must mean much.

THE SUPERVISION OF ADVERTISING IN CONFORMITY WITH THE NATIONAL POULTRY IMPROVEMENT PLAN

By G. S. Vickers,
Field Manager, Ohio Poultry Improvement
Association, Columbus, Ohio.

When the original poultry improvement plans were started in the various States, I think there were three main objectives that most of those starting these programs had in mind:

1. To promote and encourage better breeding methods and better hatchery practices with the idea that the quality of poultry would be improved and their profit possibilities increased.

2. To segregate, in some way, the honest and reputable breeders and hatcherymen, who would maintain certain minimum standards, into some kind of an organized or cooperative group or agency and by so doing give them recognition in some official or semi-official manner and at the same time provide the public with a reliable source of breeding stock and baby chicks.

3. To protect, so far as possible, those participating in this improvement work against unscrupulous members of the industry who used untruthful and unethical sales and advertising methods, and induce and educate the public to purchase from the participants in this supervised improvement work.

These three reasons can now be found in the National Poultry Improvement Plan, either in so many words, by implication, or at least by reasonable assumption.

During the early twenties when the present-day hatchery industry was just getting under way, it was similar in many respects to any other new industry so far as the ethics of the industry were concerned. Most people in that phase of the industry were so busy filling orders, making large profits, and increasing capacity that they had little time to think much of quality, truthful advertising and sales methods, or the rights of the public to whom they were selling. Consequently, anything went and those who wanted and tried to conduct their business with due regard for the truth and ethical practices found it very difficult to do so in the face of the great amount of unethical and unscrupulous competition. Many felt that either they would have to find some means of segregating and protecting themselves or adopt the methods of their competitors. They preferred to produce good chicks and good breeding stock, were willing to meet any reasonable standards to insure good quality, but they were sure they would need protection and recognition which they could not provide for themselves individually. They needed some kind of a sponsoring agency in whom the public would have confidence and which could vouch for their honesty, the quality of their products, and their egg records, pedigrees, etc., in cases where these were involved.

I think we must recognise that the prime reason most people in those early stages participated in the improvement work was the desire for protection to themselves and the future of their business rather than any great desire to perform a service to the poultry industry. This motive is selfish, indeed, but it is one of the characteristics of the human race,--and many people refer to it as one of the great weaknesses--to put self-interest first. I venture the opinion that such a motive governs our thinking most of the time. Therefore, I do not consider it unusual on the part of these people. I also venture the opinion that this motive is still the dominating one of most of those participating in the plan today and that any assumptions to the contrary will be found to be unsound.

True, these participants willingly carry on the improvement work and try to meet the obligations involved, but I believe with the idea that participating in the program in the long run will insure, or increase their profits and give them greater security. I believe that if and when they are convinced completely that this plan does not give them security, does not get the results they expected and does not pay them in one way or another, they will withdraw. It should be remembered that, almost without exception, these participants could do privately and on their own initiative everything they now do in the plan and produce just as good chicks and breeding stock. Then why should they stand the expense involved unless it does give them commensurate rewards and the recognition and security which they hope for?

It is more or less common, for instance, for breeders and hatcheries to participate because they feel they are forced to it. Good breeders go along for years and gradually see their business slip away from them because the public demands chicks from flocks headed with R.O.P. males and because hatcheries demand R.O.P. males to head their matings. Finally, they feel they must come into R.O.P. to hold their business and they come in not because of any great reverence for the plan or its objectives, but as a matter of self-protection. Full well, do I realize that some may not agree with this philosophy and I well realize also that there are a few participants who do not look at the plan in this cold-blooded manner, but to those of us who talk intimately with many hatcherymen and breeders who annually pay large amounts in the form of dues or assessments for the privilege of participating, it is common knowledge that when the checks are written the question constantly comes up: I wonder if it pays me?

Therefore, if this plan is to succeed over a long period of time and accomplish for the participants what they hope for and will in my opinion demand, it must accomplish two things:

1. Improve the quality of breeding stock and chicks so that they are definitely superior to that produced by the great mass of those not participating in the plan.

2. Establish in the public mind that the participants in the plan do put out better products, that these products are honestly and truthfully advertised and sold, and that it is safer and more profitable to purchase from such breeders and hatcheries.

If either or both of these objectives fail to be accomplished, the plan will fail sooner or later just as sure as day follows night.

This discussion is concerned with the matter of establishing confidence in the plan and its accomplishments. There is in my mind no question that the regulations and rules will provide better products if consciontiously adhered to. The matter of establishing confidence is quite largely that of dealing honestly with the public and of so supervising the advertising and sales methods of the participants that the public comes to recognize their reliability. It is also important that respect for the operation of the plan be gained by hatcherymen and breeders not participating, because if untruthful and unethical methods on the part of those participating can constantly be pointed to by the outsiders, and they are in the great majority, the public will become wise and the plan will be ridiculed to death. Since this is a democracy where freedom of speech is still one of the inalienable rights these non-participants have a perfect right to criticise and evaluate this plan, its operation and its accomplishments. If the plan and the manner in which it is supervised and operated can withstand such criticism it will progress and thrive but if it is vulnerable in many places, and this is one of the important places, trouble lies ahead. In fact, if participants are not held reasonably to the truth, it can be claimed with a great deal of logic and force that the plan is nothing more or less than a shell game with certain people and concerns being allowed to take unfair advantage of the public by using the cloak of sponsorship of the Government and the State agencies to perpetrate fraud upon the public. This the Government will not long permit, and if we are not vigilant, we will allow ourselves to be killed with our own poison.

The national plan in General Regulation 19, reads as follows:

> "All advertising must be in accord with the rules and regulations of the National Poultry Improvement Plan, and the Fair Trade Practice rules of the Federal Trade Commission of the baby chick industry."

Whether or not this is in the plan the responsibility for truthful advertising cannot be avoided, if this matter of creating public confidence is to be solved. It becomes one of the most important and solemn obligations of the State agencies and of the Government, if the public is to be fairly treated and if indeed the participants are to be so treated.

I rather imagine there may be a few who believe that the State agency is responsible for seeing that the rules and regulations are fulfilled, but do not feel that the sales and advertising methods of the members are much of their concern. I do not believe this point of view is sound for the reason that the public believes that when the Government and the State agencies accept a breeder or hatcheryman in the plan, they put their stamp of approval on him as well as on his chickens and that in doing so they are verifying to the public the fact that that person or concern is under Government and State agency supervision and is, therefore, a reliable person or agency with whom to deal. If this analysis of the public's point of view is correct, the responsibility must be obvious.

I would like to digress here just a moment to say that it is my belief that if all breeders and hatcheries conformed even reasonably well to the truth there would be far less need for improvement plans than now exists. In other words, if breeders and hatcheries wanted to produce low-quality products, told the truth about them and the public wanted to buy such, they should be permitted to buy whatever they please. This in essence is one of the fundamental doctrines of democracy as I understand them. But we all know there are plenty of poor chicks and breeding stock produced but did anyone ever see them so advertised or sold? We all know that untruthful advertising is still very common in spite of agencies set up to prevent it. And I would also add that this situation is a very serious menace to the success of the national plan. When competitors can claim the sky and all beneath it with little or no interference and when the participants are confined reasonably to the truth, their products seem pretty ordinary when the descriptions are compared. People still believe some of what they read, at least the first time, and unscrupulous persons and concerns still take a lot of business away from members participating in the plan with much inferior products merely because their sales stories and claims sound so much better. The situation is unfair and should be corrected if this plan is to progress as it should. Full well, indeed much too well, do I understand the difficulties involved, but that nevertheless does not do away with the problem and it is a serious hindrance to the success of this plan. I do not mean that the plan has no other functions than the control of the advertising of its members, because the other objectives are important and would justify the existence of the plan, but I do mean that the participating agencies will have to take an active and aggressive part in solving this problem or the entire plan will be in jeopardy.

Now we might as well be perfectly frank and admit that neither the State agencies nor the Federal Bureau of Animal Industry can possibly hope to enforce General Regulation 19 as it now stands. I refer especially to Rule 10 in the Fair Trade Practice rules which has to do with selling chicks below cost with the intent of injuring a competitor, etc. Indeed, the Federal Trade Commission has precious little to its record in the enforcement of this rule. It has had plenty of material during this season to work on. There are several other rules concerning which it is very, very doubtful if anything can be done so far as the agencies of this plan are concerned. The best we can do, I believe, is to get our members to advertise truthfully about their products. Furthermore, it would be decidedly unfair to enforce some of these rules on participants when they are not to be enforced on the entire industry.

I have already spent more time in generalities than I probably should, but I think that the importance of the problem is greater than many of us suspect. Now to get down to the problem of handling the situation.

In the first place, untruthful advertising may be intentional or unintentional. But so far as the effect is concerned on the purchaser there is no difference. In other words, if the customer didn't get what he understood he was getting and paid for it doesn't help any to tell him that it was a mistake in the catalogue or folder. He still has the same product. And just how are you to distinguish the difference? So if we assume that all participants wish to tell their stories truthfully there may still be a lot of untruthful advertising. It must be well understood, I imagine, that much of the advertising copy is prepared by advertising agencies who know little or nothing about the hatchery or breeder for whom they prepare the copy, and make little effort to find out. In some cases, fortunately, the agencies spend some time with the owners and try to get a true picture of the facts on which to base the copy. In a great many others, an agency or printing house will prepare the copy for a large number of concerns without ever talking with them and without knowing the facts. In such cases copy for most of those prepared by the same concern is pretty much alike. If the concern is given to exaggeration, you can well imagine the result. Many hatcherymen and breeders simply cannot write and prepare copy for various reasons although they may be fine breeders or hatcherymen.

There are many sad stories in the poultry business of very high class breeders failing because of their inability to advertise and sell what they produce. There are many disgusting stories of so-called breeders and breeder-hatcherymen making large profits in spite of their inability or failure to produce what their advertising claims. The combination of good breeder and good salesman and advertiser is indeed rare, which I think explains why there are not more successful R. O. P. breeders and why the turnover in R. O. P. breeders is rather heavy. Many good breeders believe that once they join the R. O. P. their sales problems are solved and make little effort of their own to sell their stock, and it doesn't work out this way.

In the next place, many of the copy writers know little or nothing about the poultry industry either as to the procedure and operations involved, or the terms commonly used in the industry. Some of them think a progeny test is something done in a test tube. Worse yet, there is an appalling amount of ignorance in the hatchery industry itself on what certain terms mean. Many are the hatcherymen who still believe that if you buy pedigreed males and mate them to culled and banded females of no known records and with no pedigreeing done that the chicks will be pedigreed and there are a great many chicks sold in this manner. Some of them apparently believe the pedigree is inherent in the mating and will automatically show up some place on the chicks. Others buy chicks from a breeder from whom they get a breeding certificate stating what they are and from what mating they come. They rear these chicks or have some flock owner rear them and then they believe the chicks from this stock the following year will be pedigreed. Still others buy a couple of males from 300 egg hens and believe the female offspring will produce 300 eggs. Why not, like begets like, doesn't it? And so on indefinitely. You know the many misunderstandings as well as I do. And, oh yes, there is one more! If the flock is tested once for pullorum disease, the flocks and chicks will be free because all the diseased birds were removed. Some of this ignorance is intentional, some is unintentional.

Then too most of us are given to exaggeration. It seems inherent in us. Just a short while back when the Hindenburg blew up in New Jersey, the first radio reports had over 100 killed, actually there were 30 some odd, and at the Kentucky Derby, the radio reports had the crowd over 100,000, yet there were according to later press reports closer to 60,000.

The exaggerations during the past hatching season concerning surpluses, price cutting, drowning of chicks, etc., were so great and so numerous as to be laughable, were they not so serious in their effects. Why, one hatcheryman told me that a neighboring hatcheryman had told him himself that he killed 40,000 chicks during an outbreak of bronchitis. The person who helped kill the chicks told me they killed about 9,000. At one auction sale near Columbus, Ohio, the story was around that 35,000 chicks were sold. Upon inquiry,at the auction, the number was actually 3,400.

People who are perfectly honest personally will allow exaggerated claims to be used in their advertising. As proof of this, all you have to do is to listen to any radio program or pick up any publication with advertising. This situation is probably not so dangerous as the deliberate falsification of known facts, because it is claimed by some that the people have learned to expect a certain amount of exaggeration. But some place along the line, exaggeration becomes untruthful and fraudulent.

Now, I realize there is a very large--shall we call it--twilight area between the truth and the untruth where you know in your own mind the claims are exaggerated and yet you can find no definite untruth and with which judgment must be used as to what will and will not be permitted. For instance, here is a man who says: "In my opinion, you cannot beat the values we offer you at these prices." He conscientiously believes it and yet you know there are places from which you would rather secure chicks at the same prices. Then there is the case where it is claimed that all breeding stock originated from certain well-known breeders or strains. It is claimed that this stock was secured and put into certain flocks and that these flocks were used to replenish all the others. In many cases, this is exactly what happened while in others, it didn't occur this way but how is it to be known and how are you to check on the matter? In this twilight area, there isn't much that can be done. Almost everybody has a certain amount of material in this category and if all the advertising copy were of this nature it possibly would not be necessary to approve it but there will be great deal of definite untruths and fraudulent claims unless it is stopped. For instance, claiming all flocks are culled and tested when they are not, claiming that R. O. P. pedigreed males with certain records are used when they are not, claiming to set nothing but 26 ounce eggs when 23 ounce eggs are used, claiming to be trap-nesting when it is not done, claiming 300-egg breeding when a couple of 300-egg hens were purchased and so on indefinitely. You know of this material as well as I.

To me there appears to be only one satisfactory solution to the situation, and that is, the approving of the advertising material before it is printed. If it isn't approved before it is printed in all probability it will never be corrected because it is inconceivable to me that untruths or mistakes in many cases are going to be corrected by supplementary mailings for two reasons: First, most people will refuse to send out a second mailing admitting their mistakes or untruths; second, the expense would be too great where mailings of any size are used. If the material is looked over before it is printed, the State agency either knows it is right or will have to assume the responsibility for approving it, if it is wrong.

Now, at first, it may appear as if this is an almost impossible job, but once it is started it is not at all bad. In Ohio, we have been doing it for over 10 years. The typewritten material before it goes to the printer is sent for approval or else the first proof is sent, but in some form before it goes to press we approve all the printed material except possibly some mailing pieces sent out later in the season which are merely reprints of material used in the original catalogue or folder. The approved and certified material is usually approved by myself and the R.O.P. material by the R. O. P. inspector or by myself if he is out, and when I feel I know enough about the operations of the concern involved to do it properly. We make it a point to be in the office each week-end so that the material is not held up for over two or three days in our office and we start warning our members early in our letters to get their advertising material in early and get it approved so as to avoid the late rush and we keep after this right straight through the winter.

I don't think any State agency can do a competent job of supervising the advertising unless some representative of the agency is more or less intimately acquainted with the members and knows pretty well what they are doing. I don't believe a man who stays in the office and rarely gets out in the field is in any position to approve or disapprove this sort of material for the very simple reason that he has no way of knowing whether the material submitted to him is right or wrong. For instance, a man who visits each member several times during the season knows whether or not he has purchased the cockerels he claims to have purchased, he knows about pedigreed chicks purchased, he knows about how many pedigreed cock birds from previous years were held over and in fact he knows pretty well about how the hatcheryman or breeder operates. Most important of all he learns to know whether the concern can be trusted, that is whether they are inclined to be a little unethical and hence to be on the lookout for certain ones. In Ohio, I spend each fall out in the field with our members while they are culling and testing, then in the winter I spend most of the time inspecting flocks, and during the hatching season most of the time is spent in visiting the hatchery members. Thus, in the normal season, each hatchery is visited at least three times. Of course, the R. O. P. man gets around still oftener and knows his members still better and still more intimately, and hence he approves their advertising because he is better equipped to do so.

As a result of this intimate knowledge which we believe we have about each member, we feel much more able to judge the accuracy of their advertising. This, I think must be obvious and needs no elaboration. I might give a few examples of how this works. Last year, the advertising of one member included a pedigreed male mating in Barred and White Rocks, but I was quite certain that they hadn't secured any new males or pedigreed chicks and that the only ones they had were their old birds. So I wrote and asked them if they would please supply me with the source of these cockerels so I could check on it. Back came a reply stating they were dropping these grades because they did not have enough males and that they had neglected to tell their advertising man to drop them in the Rocks but they were continuing this mating in Leghorns. I knew they had secured the pedigreed Leghorns.

In another case, in the material in one folder describing Buff Leghorns, it was claimed all eggs set weighed 24 ounces or more and were chalk white. Well, that's a good order for Whites, let alone Buffs, so I wrote the fellow asking him where he expected to get all these 24 ounce Buff Leghorn eggs. The next time I saw him he said he sure laughed when he got my letter because he knew blame well that wasn't right but it had slipped by him after the advertising man had written it. So it was changed to 23 ounces.

In many cases, hatcherymen buy chicks from the pedigreed pullets that are candidates for R. O. P. and feel certain they have secured pedigreed cockerels. Their advertising will come through claiming pedigreed males and we have to correct this in their minds as well as in their advertising. In most cases this is purely a misunderstanding. In this connection, I might say that constant contact with the members in most cases gives us an opportunity to steer them away from unreliable sources of stock. Usually, they are apt to ask us what we think of so and so's stock, or else they'll say they have ordered some stuff from so and so and what do we think of it. This then, provides us the opportunity to tell them the low down on certain breeders and to get them started with good strains. Of course, once in a while they go ahead and order some stock without consulting us and then comes often a peculiar situation. Suppose a man buys some pedigreed cockerels from 300 egg dams, we'll say in Australorps, and he has a letter verifying the fact that he bought these and when his advertising comes in it contains reference to these birds, but you're pretty blame sure the records and pedigrees are fraudulent. What are you going to do about it? The hatcheryman is perfectly conscientious. Well, as I see it, there isn't much you can do except to get in touch with the man, tell him the reputation of the party from whom he purchased and next time have him contact you before he buys any stock so you can help him in locating reliable sources.

After all, this whole improvement work is as much if not more education, than supervision and inspection, according to my way of looking at it, and it is our job to educate our members on these various items and help them in every way possible. If we aren't of help and if our advice isn't sound and all we do is inspect, then I feel there isn't much future for them or us in the plan. When I make my rounds visiting members, I go there with the idea of being of definite help if I possibly can, as well as doing a job of inspecting. More time is spent with most members discussing their problems than there is in inspection. I feel now that I know pretty well where close inspection is needed and where it isn't. And I know pretty well whose advertising needs to be watched closely and whose does not. If I hadn't found this out in ten years I would feel with justification that I wasn't very smart and none of us ever feel that way about ourselves.

There often comes up the question of hatcheries using the same folder two years. Possibly the material is equally applicable both years, and maybe it isn't. This past year we had one member who was using last year's folder. It stated that he was trap-nesting and pedigreeing White Leghorns and White Rocks. Since last year, he had stopped trapping Leghorns, and so I insisted that if the folder was to be used, an insert stating this fact would have to be used. Well, we had quite an argument. His point of view was that his stock was just as good since he hadn't sold any of this pedigreed stock before anyhow and still had the benefits of this previous program. My point of view was that it was an untruth pure and simple, and there couldn't be any question about it. Well, he wanted to know what I would do if he didn't use this insert. My reply was that I would prefer charges against him and bring the matter up before our board of directors. So the following insert was used with the folder:

Important Notice

> "Due to conditions beyond our control, we are not at present trapping or progeny testing White Leghorns nor progeny testing White Rocks. We are trapping White Rocks and will be trapping White Leghorns and New Hampshires this fall. However, this change in our breeding program in no way lowers the quality of our chicks this season as all our breeding stock has received the benefit of last year's and previous years' trapnesting breeding programs. We make this statement so that no false impression be created on what we have to say concerning our trapnesting and breeding work in our literature, which was published prior to the above mentioned changes in our breeding program."

Of course, there are many, many points concerning which it is difficult to make decisions in view of so many generalities and uncertainties and in view of the type of advertising used in the industry in general. There are so many generalities used, particularly when the material is prepared by advertising men, that while they sound glittering, too good to be true almost, yet there is nothing untruthful in them to which you can point. This ability is one requisite of a good advertising copy writer I presume. There isn't much you can do about such material and when in doubt we usually give the hatcherymen and breeders the benefit of the doubt if they want to use it in view of the nature of competition but we usually make some comments about it in our return letter.

In many cases we come across material that we know to be untruths or mistakes and we correct these and always write the party concerned so that we have a record of it in our office if it ever comes up later. If at all suspicious we write a letter to the party concerned asking pertinent and pointed questions concerning the points in question, and if very serious we hold the material until it is cleared up. Usually the reply adequately and satisfactorily explains the points, or if they can't be satisfactorily explained and the person knows it the reply usually informs us to delete that part. It's always well to have written material of such kind, otherwise it is one person's word against the other's. In other cases, we suggest changes in wording to clarify a point or remove any doubt about how a statement might be interpreted. In some cases, where the material is real poor, we write or see the party and suggest to them that the material just isn't any good, that it probably won't sell chicks, and we suggest that they have it rewritten by someone else who knows more about the business. This usually occurs when the material is written by some local printer who knows absolutely nothing about the poultry business or preparing advertising material either. If they don't wish to take our advice that is all right with us so long as the material is truthful.

There are so many different angles to the many situations that come up that it is impossible in a discussion such as this to go into detail. State agencies should have little trouble in getting the members to use advertising that will conform reasonably well to the facts and in such a way as to be fair to both the participating members and the public alike. As I said before this will require the services of a person who knows quite intimately his own membership and their operations, who knows more or less intimately the situation in the hatchery and poultry breeding business in his State, and who has the good judgment to make decisions on such matters that will alike be fair to the members and to the public. This, in my opinion, requires a person with some experience, some diplomacy, and in certain situations a goodly amount of the old-fashioned intestinal fortitude.

In conclusion I would like to repeat that I think this is one of the most important phases of the plan, if we are to maintain the respect of our own participating members, the respect of other members of the industry, and of the public. If we do not establish and maintain this respect we haven't much else that counts. Furthermore, if we do not do a good job of it, the United States Bureau of Animal Industry because of its unique position in this plan will be forced into an impossible position of sponsoring a group of people who are exploiting the public under Government sponsorship and such a situation cannot long endure and should not. The only adequate solution that I can see is the approving of the advertising material by the State agencies before it is printed, and this is really not a difficult problem and one that every State agency should adopt.

A CONSTRUCTIVE POULTRY BREEDING PROGRAM

By C. W. Knox,
Bureau of Animal Industry,
U.S. Department of Agriculture.

It is practically impossible to increase egg production beyond a certain point in any flock of chickens without proper regard to selection and breeding. It is also true that no matter how much care is given the chickens, they cannot lay eggs beyond their hereditary capacity.

As with egg production, hatchability, egg size, and body weight cannot be increased beyond certain limits unless some constructive breeding program is followed. Because the majority of poultrymen, supervisors, and inspectors have excellent knowledge and experience in selecting, feeding, and management of chickens used as breeders, these phases of a successful breeding program will not be discussed. It must be remembered, however, that in any successful breeding program these factors must be carefully considered at all times.

In Kansas Agricultural Experiment Station Bulletin 203, Lippincott showed what could be done in improving color, type, body weight, and egg production by crossing standardbred males of several different popular breeds of chickens with a mongrel flock. The results obtained were very good and demonstrated the value of "top crossing". Of course, the best method of breeding is done by regarding the breeding potentialities of the females as well as the males. But this requires trap-nesting and pedigreeing which is being done by only a few breeders. In order to obtain maximum improvement in the various characteristics already mentioned it is necessary to have a breeding program that can be used by a large number of poultrymen and developed in such a way that the improved stock can be distributed to a majority of poultry keepers. The first and second stages of the National Poultry Improvement Plan provide an excellent vehicle for an extensive practical breeding program and for the distribution of a great number of chicks. However, such a program as will be briefly discussed is not limited to the first and second stages of the National Poultry Improvement Plan but may be used by any hatcheryman, flock owner, or breeder who wishes to follow a systematic well-organized breeding program.

Inbreeding is an excellent means for "fixing" characteristics in any class of livestock. However, only a few breeders can inbreed their stock successfully because such detrimental factors as poor fertility, smaller body weight, and lower viability seem to become "fixed" (homozygous) much more quickly than the corresponding desirable characteristics. Therefore, inbreeding cannot be recommended for a general breeding program.

Line breeding, which is a mild form of inbreeding, can be recommended because it has most of the benefits of inbreeding and is not so liable to produce the detrimental results so often encountered in inbreeding. It takes a considerably longer period of time, however, to "fix" the desirable characteristics. Line breeding has been shown by many breeders and scientists to be quite successful and is adaptable to a general breeding program. Combining top-crossing and linebreeding, both of which have been shown to be successful, into a well-organized breeding program adapted to general use is suggested in order to obtain and maintain beneficial results.

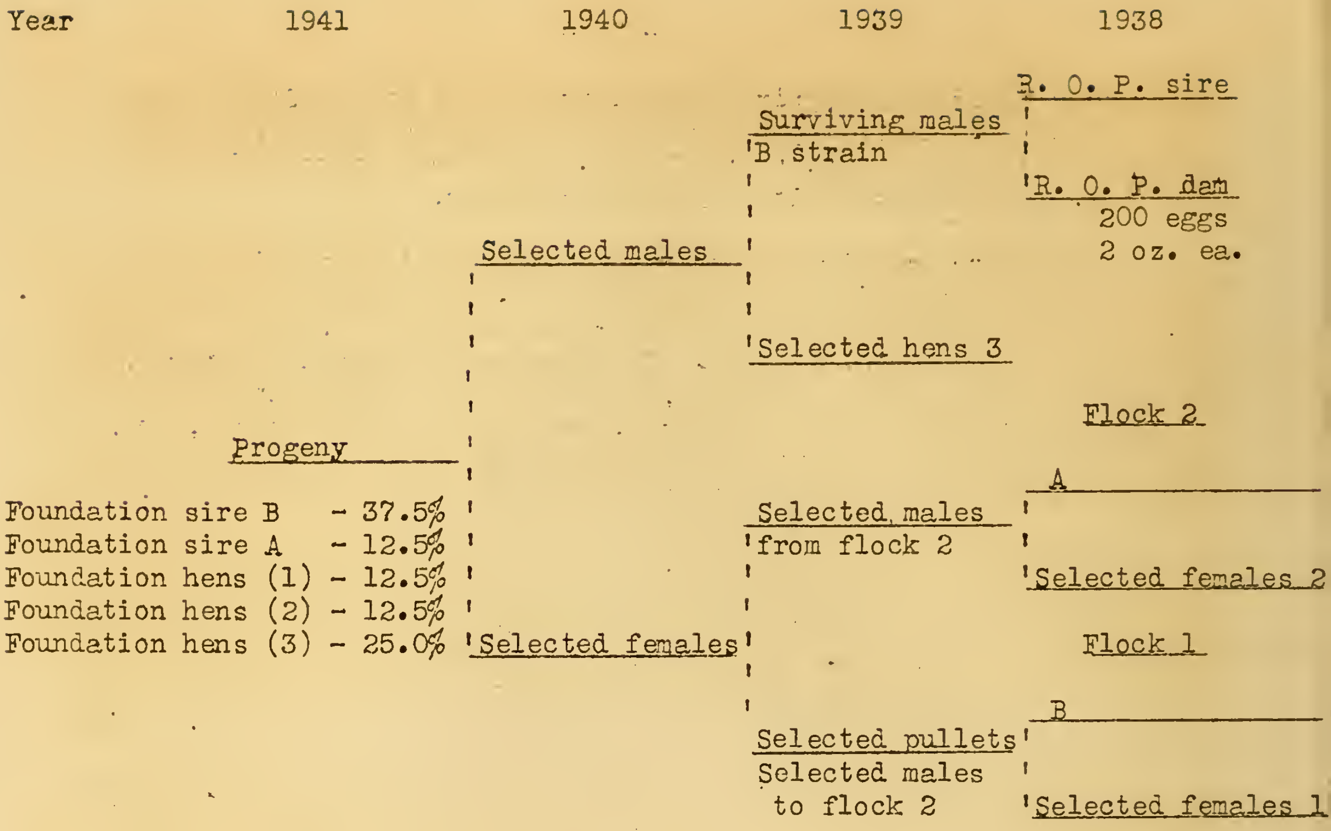
The foundation males are very important in any breeding program and their value must not be overlooked. It is possible that in the future the R.O.P. flock owners can supply foundation males for use in at least the majority of hatchery flocks and through the hatcheries indirectly supply the poultry keepers of the States with superior stock. It is imperative that hatcherymen use to the best advantage males that head their flocks. This means that such birds should be used in a definite, systematic manner.

There are two big reasons why the male is the most important part of a hatcheryman's breeding operations. The male is more important than the female due to the difference in numbers between the males and females used in the matings. For instance, in single matings where one male is mated with 16 females, the females producing an average of 20 chicks during the hatching season, or a total of 320 chicks, the male contributes 50 percent of the breeding influence to all of these chicks whereas each female contributes 3-1/8 percent of the total.

The second important reason that males are more important is because geneticists tell us that where sex-linkage is concerned, the male contributes two doses for the particular characteristic concerned and the female only one. Therefore, his transmitting ability is stronger than that of the female, especially where such characters as egg production and other quantitative characters are concerned. This is especially true in the case of egg production since it is known that at least four characters are concerned in egg production. These four characters are sexual maturity, rate of laying, persistence of production, and broodiness. Sexual maturity has been found to be an important factor in egg production and there is considerable evidence to show that this character is in part inherited in a sex-linked manner.

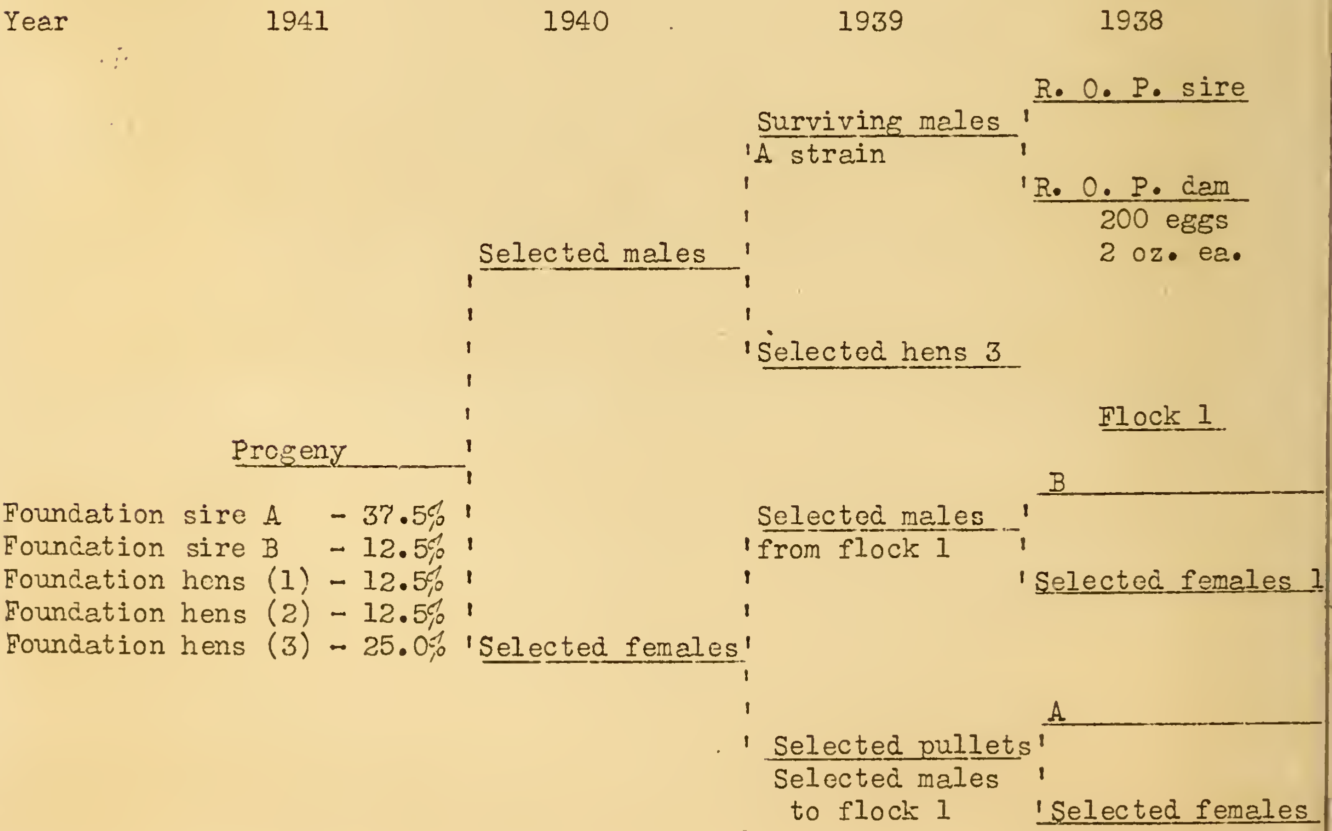
The following schematic arrangement in pedigree form of breeding operations illustrates an organized effort to use top crossing and line breeding in hatchery flocks or individual flocks where pen matings are used. This type of breeding requires no trap-nesting or pedigreeing of the progeny. In case the flock owner adapts this program to single male matings it will be necessary for him to identify the chicks from the different pens by "toe punching" them or by using some other means of identification. For the sake of simplicity hatchery flocks 1 and 2 are used in this schematic arrangement for the purpose of illustration. To make these illustrations applicable to flock owners, it is only necessary to read pen 1 where the chart states flock 1 and pen 2 for flock 2.

CHART 1 - FLOCK 1.



Foundation sire B - 37.5%
Foundation sire A - 12.5%
Foundation hens (1) - 12.5%
Foundation hens (2) - 12.5%
Foundation hens (3) - 25.0%

CHART 2 - FLOCK 2.



Foundation sire A - 37.5%
Foundation sire B - 12.5%
Foundation hens (1) - 12.5%
Foundation hens (2) - 12.5%
Foundation hens (3) - 25.0%

The first year pedigreed males are purchased to be used as foundation stock. These males must be obtained from at least two different sources. For the purposes of illustration males from one source will be mentioned as males A and from the other source as males B.

The first year, 1938, males A are mated to carefully selected females in flock 1 and males B are mated to carefully selected females in flock 2. The males from each source may be full brothers or not so closely related. The following year, 1939, the hatcheryman selects the best males from each flock and has the cockerels from flock 1 placed in the breeding pens of flock 2. The same year he places the males from flock 2 in flock 1. In addition to this another mating is made in each flock. In flock 1 this mating consists of the surviving foundation males mated to carefully selected hens. In flock 2 a similar procedure is followed, the surviving foundation males being mated to selected hens. The next year, 1940, males from the latter mating are mated to the best pullets available from the former matings. The progeny from such a mating will be line bred to the extent that they will have a coefficient of relationship of 37.5 percent to the foundation male.

This coefficient of relationship of 37.5 percent is merely an indication of the extent of line breeding that has been accomplished. In addition to this it is a definite figure that illustrates the probable proportion of the "blood" of the foundation males that is transmitted to each individual flock. In Lippincott's investigation he used standardbred Barred Plymouth Rock males mated to mongrel females with an average annual egg production of 98.5 eggs. Each subsequent year he mated the female progeny to other standardbred Barred Rock males. The female progeny of the third breeding season produced an average of 149.6 eggs. The same method of breeding was followed using Single Comb White Leghorns with the result that an average of 188.6 eggs were produced by the progeny as compared to the average of 72.3 eggs per year for the mongrel females used at the start of the experiment.

In conclusion it may be stated that breeding results will be obtained in a direct ratio with the time and thought placed upon the breeding operations.

DEVELOPING FOUNDATION BREEDING STOCK

By Morley A. Jull, head of Poultry Department, University of
Maryland, College Park, Md.

Many poultrymen fail to realize that heredity is inescapable. Every year too many poor producers are kept and used for breeding. Mediocrity tends to reproduce itself, and if egg production is to be increased, the most careful selection of the breeding stock is essential. But the problem goes deeper than this. For the poultry industry as a whole, it is of the first importance to develop strains of fowl that will produce eggs more efficiently. The cost of production and reproduction should be reduced. The very size and wide extent of the industry makes this all the more important.

Although many strains of modern breeds lay an average of 180 or more eggs in a year, there is still great variability among all of the stocks of any country, for some strains or families may average only 80 or 90 eggs per bird while other strains or families may average 200 or more eggs per bird even though all may be kept under the same environmental conditions.

Studies on the inheritance of egg production have been based for the most part on the number of eggs laid from the time that laying commenced to and including 365 days thereafter, this period denoting what is called the first laying year. Perhaps, however, the first laying year should embrace the period from the onset of egg production to the time of cessation of egg production which usually precedes the first annual molt. This involves several difficulties, the chief of which is that it is extremely difficult to determine when the first annual molt begins and when it is completed. Moreover, the cess tion of egg production does not always precede the annual molt. As a matter of fact, egg production is such a complicated physiological process that any basis upon which its inheritance is studied involves numerous difficulties. On the other hand, the 365-day period from the time that laying commences has been found satisfactory for all practical purposes, and the subsequent discussion on the extensive observations of many investigators is condensed with a view toward presenting as comprehensive a picture as possible of existing knowledge concerning the inheritance of egg production, the most important economic character with which most poultry breeders are concerned.

It has been found that the following four factors are of major importance in determining the number of eggs laid during the first laying year: (1) age at which laying commences, known as sexual maturity; (2) rate of laying; (3) nonbroodiness; (4) persistence of production. These four biological factors have each been found to be intimately associated with total first-year egg production. A fifth factor, that of pause in egg production, is believed by some investigators to be a biological factor independen of rate of laying but it is felt by others to be associated with rate of laying

Sexual Maturity.--It has long been established that the increase in the level of first-year egg production that has been secured in many flocks is due, to a considerable extent, to the earlier age after hatching that laying commences as compared with poorer producing flocks. When a pullet commences laying she is said to be sexually mature and recent investigational work has demonstrated that sexual maturity is inherited. In other words, birds that commence laying early in life differ genetically from birds that commence laying late in life.

Although it is undoubtedly true that sexual maturity is inherited and that several genes are involved, including at least one sex-linked gene, it is clear from recent research that the cause of differentiation in sexual maturity among birds is accounted for, in part at least, by differences in the functional activity of one or more of the endocrine glands that secrete the hormones, many of which have been shown to have a pronounced effect in regulating various functions of the body. For instance, it has been demonstrated that a hormone secreted by the anterior lobe of the pituitary influences the development of ova and is a factor in determining sexual maturity. It may be, of course, that the functional ability in secreting this hormone at different levels is inherited but at any rate it is clear that much more work is necessary before the mode of the inheritance of sexual maturity is completely solved.

Rate of Laying.--Nearly all birds lay at a higher rate in the spring of the year than at other times, rate of laying referring to the number of eggs per month or for any given period. It is interesting to observe that for birds in the same latitude in different parts of the world the seasonal curves of egg production are quite similar. The reason given for the increase in the rate of laying during the spring months is that the birds respond to the gradual increase from day to day in the amount of daylight or sunlight. It has been demonstrated that the anterior lobe of the pituitary secretes a hormone that provides a stimulus for the development of ova. The activity of the pituitary gland is influenced by the action of light, the bird's eye being sensitive to the intensity of illumination. Under conditions of increasing light intensity more of the hormone is secreted and this substance circulating in the blood stimulates the ovary to increased production. It should be observed here that the increased egg production that usually follows the artificial lighting of laying houses is due to the increased activation of the pituitary gland by light through the bird's eyes and as a result of increased egg production the birds consume more feed.

Broodiness.--It is well known that Mediterranean breeds have much less broodiness than Asiatic, American, and English breeds. Also, strains within a breed may differ significantly in amount of broodiness exhibited. The results of research on the inheritance of broodiness conducted at the Massachusetts and Illinois Agricultural Experiment Stations and at Cambridge University, England, have demonstrated that at least one pair of sex-linked genes and probably several autosomal genes are involved.

It seems to be a general phenomenon that when two breeds are crossed the progeny exhibit a pronounced degree of broodiness, usually considerably in excess of the broodiness shown by either of the parental breeds.

It is very interesting to observe that the pituitary gland of birds that are genetically broody contain larger quantities of a hormone called prolactin than the pituitary gland of birds of nonbroody genetic constitution. Also, among birds that are genetically broody, the pituitary of those in broody condition contain more prolactin than when they are not broody. Thus, it is apparent that broodiness is influenced by a complicated physiological mechanism as well as having a genetic basis.

Persistence of Production.--Strains of fowl often differ markedly in the length of time that laying is continued during the summer and fall in the year following that in which the birds were hatched. In fact, families within a strain frequently differ considerably in the length of time that laying is continued toward the close of the first-year production period. Persistence of production is a very desirable characteristic for it is obvious that the longer laying continues the greater the first-year record of production.

It has been definitely established that the termination of the first year of laying is intimately associated with the onset of the first annual molt, except that a few birds have been known to continue laying throughout the entire period of molting. The process of molting includes the shedding and renewal of the plumage. In persistent producers molting takes place much later than in non-persistent producers, presumably because the activity of the sex glands tends to inhibit the onset of the molting process.

In the case of laying hens the onset of the molt is conditioned by the activity of the ovary and the anterior lobe of the pituitary gland and when these glands cease to function or function at a lower level molting is induced through the activation of the thyroid gland. Molting in persistent layers takes place later than in non-persistent layers as a result of heritable differences in the functioning ability of the ovary and the anterior lobe of pituitary gland. That presistence of production is inherited there can be no doubt, for by the adoption of a proper system of selection and breeding it is possible to develop in a flock persistent production to a relatively high degree, as shown by the success achieved in the Rhode Island Reds at the Massachusetts Agricultural Experiment Station.

Selecting Breeding Stock

Breeders are concerned not only with the number of eggs laid but also with their size, shape, and hatchability, and with such matters as the size of the birds and the extent to which they conform to the standards for the breed or variety being kept. Birds that do not come up to par in one or more respects are often culled from the flock, and rarely does it happen that a poultry breeder keeps all the progeny of a given mating. For economic reasons he is obliged to cull the loafers among his layers, and since small eggs are objectionable from a market standpoint, birds that lay small eggs are not kept for breeding purposes. In most flocks so much culling is practiced that it is a very difficult matter to secure an accurate index of the breeding worth of the sires and dams; for superior breeding worth is not a matter of producing a few good layers--it is a matter of getting high average production in all of the progeny of the breeding stock.

Although the average egg production of the birds of the country as a whole is very low, in some States there are numerous flocks whose level of production is maintained at approximately 150 eggs per bird year after year. In a number of the States the extension poultry specialist connected with the State agricultural college arranges with a group of the more progressive farmers to keep accurate annual records of egg production and feed consumption. These flocks are called farm demonstration flocks, and the records secured from them serve a very useful purpose in impressing upon flock-owners the necessity of securing a good level of egg production to make a reasonable labor income.

The females of each demonstration flock are selected at the beginning of each laying year for vigor and for external characteristics indicative of good laying ability. The males are selected for vigor and type. In some States the work has been carried on for a number of years, and it is interesting to note that during recent years the average egg production per bird has been near the 150 egg level. The data in table 1 give the records of egg production per bird during 1927 to 1933, inclusive, for five States.

Table 1.--The average annual egg production per bird for each of 7 consecutive years in farm-demonstration flocks in 5 States

Year	Average annual egg production per bird					
	Indiana	Maine	Missouri	New Hampshire	Ohio	Average
1927.......	150	138	142	145	149	145
1928.......	153	142	150	155	149	150
1929.......	145	150	147	148	151	148
1930.......	152	147	145	150	149	149
1931.......	145	153	154	157	155	153
1932.......	138	161	147	157	150	151
1933.......	140	159	143	163	145	150

The data in table 1 indicate that for a period of 7 years very little, if any, progress was achieved in increasing production over the level at the beginning of the period. Moreover, since improved methods of feeding and flock management should be expected to raise the level of production over a period of years, it is quite apparent that the mass selection of breeding stock, which has been the usual practice for these flocks, is relatively ineffective in increasing egg production. As a matter of fact, no one has ever presented evidence showing that the level of egg production is raised through the mass selection of breeding stock. In order to secure increased egg production, owners of farm demonstration flocks would be well advised to secure males for breeding purposes that are the progeny of sires and dams that have been proved to be superior in breeding worth.

The Three-P Program--Production Record, Pedigree, and Progeny Test

A practical breeding program intended to produce superior germ plasm, which means superior breeding stock, must rest on a three-point base: Production record, pedigree, and progeny test.

Each of these must be given due weight. At the same time, each has its pitfalls, and if the breeder does not beware of them, he will find that his results fail to come up to expectations.

Production Records of Limited Value

With a few outstanding exceptions, most of the poultry breeders in the United States apparently attach considerable significance to the first-year records of the females. Many of them seem to assume that, since a record of 200 eggs is the minimum requirement for record-of-performance qualification, all birds laying 200 or more eggs are bound to be good breeders. Moreover, there is a widespread belief that the higher the first-year record of the dam, the more eggs will her pullet progeny lay. In other words, it is claimed that the number of eggs a bird lays during her first laying year is a criterion of her breeding worth.

Data have been obtained from different sources which show that actually the first-year production record of a female is only of very limited value in predicting her breeding worth, especially when the breeding females are selected on the basis of having laid 200 or more eggs during their first laying year, as is the case in record-of-performance work in the United States. A true test of the relationship that normally exists between the egg production of dams and the egg production of their daughters could be made only in the case of dams not selected on the basis of first-year egg-production records and complete families of daughters--that is, where no culling of pullets was practiced during the first laying year. Insofar as is known, however, no such data exists for the simple reason that in practically all projects on breeding for increased egg production, the dams are selected to a greater or less extent on the basis of their first-year records.

However, data are available which show the relationship between the egg production of selected dams and the egg production of unselected daughters, the records of all daughters except those that died being included. In table 2 are given data on Rhode Island Reds at the National Agricultural Research Center, Beltsville, Md., and on White Leghorns at the Mount Hope Farm, Williamstown, Mass., the latter having been very kindly supplied by H. D. Goodale. The Beltsville dams were selected on the basis of having laid a minimum of 200 eggs their first laying year, whereas in the case of the Mount Hope Farm dams the minimum given in table 2 is 181 eggs. Insofar as is known, except for flocks maintained at the Massachusetts Agricultural Experiment Station and at a private breeding establishment in California, the new flocks providing the data for table 2 are the only ones in the country in which all pullets that lived were allowed to complete their first year of laying, embracing 365 days from the date of the first egg in the case of each pullet.

Table 2.--The average egg production of the daughters of dams classified according to the range in egg production of the dams.

Range in egg production of dams	Average egg production of daughters		Range in egg production of dams	Average egg production of daughters	
	Beltsville Rhode Island Reds	Mount Hope Farm[1] White Leghorns		Beltsville Rhode Island Reds	Mount Hope Farm [1] White Leghorns
181-190...........	....	162	251-260..........	201	188
191-200...........	....	157	261-270..........	200	209
201-210...........	188	168	271-280..........	197	188
211-220...........	205	161	281-290..........	179	208
221-230...........	192	173	291-300..........	....	222
231-240...........	192	176	301-310..........	....	228
241-250...........	199	169	311-320..........	....	220

[1] Data from an unpublished paper given at the Poultry Science Association meeting, 1935.

The data in table 2 show no apparent relationship between the egg production of the dams and that of the daughters among the Beltsville Rhode Island Reds, but they show a slight relationship between the egg production of dams and that of the daughters among the Mount Hope Farm White Leghorns.

It is interesting to observe that the average egg production of the daughters of each of the first six groups of Beltsville dams was considerably higher than the average egg production of the daughters of each of the comparable groups of the Mount Hope Farm dams. The Beltsville data were obtained from matings of yearling and older hens made in 3 consecutive years, 1928 to 1930, inclusive, the dams being mated to males whose dams laid 200 or more eggs during their first laying year. The Mount Hope Farm data were obtained from pullet matings made during the years 1923 to 1929, inclusive, and Dr. Goodale has stated that the low-producing dams listed in the table were used mainly during the first 2 or 3 years. Moreover, the sires he used each year were selected on the basis of the records of egg production made by their sisters up to February 1, from which it may be assumed that the males selected one year were somewhat superior to the males selected the preceding year. The use of sister-tested males should in itself tend to increase the egg production of the daughters raised each succeeding year, even if the dam's record of egg production had been the same for each of the 7 years.

Even so, it is apparent that the relationship between dam and daughter egg production is of a relatively low order. For instance, the group of dams with a range in production of 201-210 eggs had daughters that averaged 168 eggs, whereas the group of dams with a range in production of 271-280 eggs had daughters that averaged 188 eggs. The average egg production of these groups of dams differed by approximately 75 eggs, but their daughters' averages differed by only 20 eggs. The White Leghorn data show, however, that on the average the higher the egg production of the dams the higher the egg production of the daughters.

Those who hold that the egg-production record of a selected dam is an index of her breeding worth should examine carefully the source of the data on which their belief is based. In table 2 it is shown that the Mount Hope White Leghorn dams that laid from 201 to 210 eggs had daughters that averaged 168 eggs each, and the dams that laid from 281 to 290 eggs had daughters that averaged 208 eggs each, the difference in the average egg production of the two groups of daughters being 40 eggs. On the other hand, the Beltsville Rhode Island Red dams that laid from 211 to 220 eggs had daughters that averaged 205 eggs, whereas the Mount Hope White Leghorn dams that laid from 211 to 220 eggs had daughters that averaged 161 eggs, there being a difference of 44 eggs in the average production of daughters that came from dams with the same records. The difference in the average egg production of daughters of dams with similar records was 4 eggs greater than the difference in the average egg production of daughters of dams that differed in egg production by approximately 80 eggs. Then again, those who claim that the first-year record of egg production of a bird is a good index of her breeding worth, would have greater difficulty in accounting for the fact that the Beltsville dams with a range of 201-210 eggs and the Mount Hope dams with a range of 271-280 eggs produced daughters that had exactly the same average egg production.

If the first-year egg-production records of a female served as an accurate index of her breeding worth, as some have claimed, the problem of breeding for increased egg production would be comparatively simple. The data in table 3 show how divergent are the results sometimes secured from two groups of daughters produced by the same dam mated in different years to the same or to different sires. These data were obtained from the National Agricultural Research Center, the first five dams in the table being Rhode Island Reds and the second five White Leghorns. The daughters' averages given in the table were determined for all daughters produced by each mating except for birds that died.

Table 3.--The average egg production of each group of daughters of dams mated to the same and to different sires in 2 different years.

Dam no.	Sire no.--		Dam's egg production	Average egg production of daughters	
	First year	Second year		First year	Second year
Rhode Island Reds:					
6024............	176	176	212	217	189
6027............	176	176	206	178	222
6401............	334	334	233	214	184
5829............	325	338	246	189	241
6142............	351	368	242	182	220
White Leghorns:					
2786............	50	249	257	159	228
3472............	100	248	235	212	172
3728............	91	248	258	213	167
3845............	91	248	262	175	202
3287............	100	249	230	164	225

The data in table 3 show that the same dam when mated to the same sire may produce daughters in two different years that differ in average egg production by as much as 40 eggs. When mated to different sires the daughters of the same dam in successive years differ by as much as 60 eggs.

It is unfortunate for the poultry-breeding industry that many poultry breeders attach so much importance to individual records of production, especially since it has been shown that progress in breeding for increased egg production is bound to be achieved very slowly as long as a record of egg production is the only basis used in selecting the breeding stock.

There are several reasons why the record of a bird's egg production may not be nearly so significant in indicating her breeding worth as many poultry breeders are inclined to believe. Egg production is a quantitative characteristic that is easily influenced by environmental conditions and by the diet given the laying stock. Poorly balanced diets, improper methods of feeding, poor housing conditions, sudden changes in temperature, internal and external parasites, and diseases of various kinds all significantly decrease production. There may be a vast difference between the number of eggs a bird actually lays and the number she might have laid if she had been kept under ideal conditions. Rarely do ideal conditions prevail, however, that enable a bird to lay the number of eggs of which she is potentially capable.

The Importance of Pedigree

By pedigree breeding in poultry is meant the mating of birds with pedigrees and keeping account of the parentage of the chicks produced so that their pedigrees are a matter of record. A bird's ancestry sometimes gives considerable information of value regarding its probable worth as a breeder. Of two birds with the same first-year egg-production records, the one with a good ancestry is to be preferred to the one of poor ancestry. The chances are greater that the former will give better results in breeding than the latter; the chances are greater--but there is no guarantee that a bird of good ancestry will always produce good progeny.

Although a good pedigree is of importance in selecting breeding stock, there are certain limitations in the application of pedigree selection. For instance, very little significance can be attached to individual records of egg production of ancestors beyond the third generation. Then again, the greater the variation in the environmental conditions--including diet, method of housing, and the use of artificial lights--to which a flock is subjected over a period of years, the less reliance can be placed upon the ancestors' records of production in the selection of progeny for future breeding purposes.

The data in table 4, pertaining to Beltsville Rhode Island Reds and Mount Hope Farm White Leghorns, show that the higher the egg production of the three nearest female ancestors of both sire and dam, the higher is likely to be the average egg production of their progeny. In the case of each flock, the environmental conditions were kept as uniform as possible from year to year.

Table 4.--The average egg production of daughters according to the range in average egg production of the three nearest female ancestors of both sire and dam.

Range in average egg production of the three nearest female ancestors of both sire and dam	Average egg production of daughters		Range in average egg production of the three nearest female ancestors of both sire and dam	Average egg production of daughters	
	Beltsville Rhode Island Reds	Mount Hope Farm White Leghorns[1]		Beltsville Rhode Island Reds	Mount Hope Farm White Leghorns[1]
209-217.........	186	....	254-262.........	....	199
218-226.........	197	180	263-271.........	....	213
227-235.........	199	166	272-280.........	....	216
236-244.........	205	176	281-289.........	....	210
245-253.........	....	208	290-298.........	....	210

[1] Data from an unpublished paper given at the Poultry Science Association meeting, 1935.

Judging from the data in table 4, it is apparent that the selection of breeding stock on the basis of ancestors' records of production to the third generation is of considerable importance. As a matter of fact, the more information there is in the pedigree concerning the records of egg production of the sisters of parents and grandparents, and the more information there is concerning the breeding performance of parents and grandparents and their relatives, the greater the value of the pedigree in selecting breeding stock.

The Significance of Progeny Testing

The supreme test of the worth of a bird as a breeder is the kind of progeny it produces. Thus in the case of a dam it is not her individual laying record that counts so much as the average laying record of her daughter which is quite a different thing. Strangely enough, the first impetus given t progeny testing in breeding for increased egg production was the failure resul ing from an attempt to develop an egg-laying strain through the selection of female breeders based entirely on their first-year records of egg production. Apparently, the first attempt at a State institution to improve egg productio through selection was made by the late G. M. Gowell of the Maine Agricultural Experiment Station. Gowell's work was carried on some 35 years ago with Barr Plymouth Rocks, and the records show that over a period of 9 years the practi of selecting female breeders on the basis of their first-year trap-nest recor failed to produce an increase in the level of egg production among the pullets raised each year.

The work of Gowell, however, laid the foundation for later work which demonstrated the significance of the progeny test in breeding for increased e production. Continuing the breeding work with the Barred Plymouth Rock at th Maine Station, Raymond Pearl demonstrated that by selecting cockerels and pullets for future breeding purposes each year from among the best families o that year, a steady increase in the level of egg production was achieved. Cockerels and pullets to be used as breeders were selected from among the progeny of sires and dams that proved to be superior in breeding worth to oth sires and dams. The progeny-test method of selecting breeding stock has been used consistently for a period of years in the breeding of Rhode Island Reds at the Massachusetts Agricultural Experiment Station, where F. A. Hays has achieved outstanding results.

It is particularly important for poultry breeders to be able to identify sires of superior breeding worth because the average sire has about 10 times as many chicks as the average dam. A practical way of applying the progeny test to sires without trap-nesting either the dams or their daughters has been suggested by A. L. Hagedoorn of the Netherlands. Separate breeding pens are maintained in each of which one male is mated to the usual quota of females. The chicks from each sire are banded at hatching time so that the pullets can be distinguished from the pullets secured from other sires. The laying pullets from each sire are placed in separate houses or pens, and by comparing the average egg production of the pullets of each sire, the breeder is able to determine which sires were superior in breeding worth.

The difference in breeding worth of sires mated to trap-nested Rhode Island Red dams having minimum first-year records of 200 eggs and White Leghorn dams having minimum first-year records of 225 eggs is shown in table 5. The data were obtained from a few of the matings made at the National Agricultural Research Center. The records of egg production of all daughters placed in the laying houses, except for birds that died, were used to compute the average for each of the different groups of daughters. The mortality amo Rhode Island Red daughters was 9.17 and among the White Leghorns 13.26 percen

The average egg production of all the Rhode Island Red daughters was 193.03 and of all the White Leghorn daughters 192.85.

Table 5.--Average egg production of daughters of different Rhode Island Red sires mated to Rhode Island Red dams that laid 200 or more eggs, and of different White Leghorn sires mated to White Leghorn dams that laid 225 eggs or more.

Sire no.	Rhode Island Reds			Sire no.	White Leghorns		
	Average egg production of sire's mates	Number of daughters	Average egg production of daughters		Average egg production of sire's mates	Number of daughters	Average egg production of daughters
173........	223	48	219	3..........	248	45	229
10105......	242	49	216	250........	243	37	227
334 (1)....	231	37	211	249	243	71	206
338 (1)....	238	31	206	252	247	48	200
334 (1)....	242	32	205	91.........	254	46	199
330 (1)....	246	46	201	100........	248	59	193
330 (1)....	250	38	195	259........	243	59	185
200........	243	52	193	254........	237	51	179
338 (1)	250	60	192	10106......	239	46	179
351........	232	75	171	50.........	228	49	168

(1) These sires were used ih 2 consecutive breeding seasons.

The data in table 5 make it quite clear that certain sires were much superior to others from the standpoint of transmitting laying ability to their daughters. The sons and daughters of sires nos. 173 and 3 are likely to be much better breeders than the sons and daughters of sires nos. 351 and 50.

A matter of great importance that tends to retard progress that might otherwise be achieved in record-of-performance work is the fact that many of the pullets originally entered in the project are culled before being allowed to complete their first laying year. Disease and sickness are sufficiently good reasons for some of the culling, but other pullets are culled because they start laying very late in life or lay at a very slow rate or lay very small eggs. or for other reasons. Of course, a considerable amount of this culling is undoubtedly justified on purely economic grounds; the poultry breeder must make a living out of his business, and he feels justified in cullint the birds that, he feels certain, have all the earmarks of uneconomical producers. At the same time, the practice of culling pullets during their first laying year tends to destroy what is known as the random sample of a population.

What all progressive poultry breeders must sooner or later realize is that the best way of determining the relative merits of the sires and dams used each year is to keep a random or representative sample of their progeny. When only selected pullets are kept, it becomes impossible to tell whether the breeding birds from which they came were really capable of producing stock of high average merit. The pullets culled out as being too poor to keep may more nearly represent the breeding worth of their sires and dams than the pullets that were kept. This is a point that cannot be emphasized too strongl

The data in table 6 give the average egg production of the daughters of different sires used by private poultry breeders who kept all of the daughte of each sire throughout the first year of laying.

Table 6.--The average egg production of daughters of different sires used in a few private breeding flocks

Poultry breeder	Variety	Sire no.	Average egg production of sire's mates	Number of daughters	Average egg production daughter
A	White Leghorns	G10	264	76	219
		G8	276	84	218
		G4	262	80	209
		G-7	261	135	198
		G-6	276	108	191
		G-2	274	105	166
		G11	285	114	163
B	White Leghorns	1	283	130	243
		2	289	39	240
		3	259	55	228
		4	273	18	169
		5	255	33	152
	Rhode Island Reds	1	252	57	242
		2	277	104	235
		3	268	26	234
		4	237	39	168
		5	270	28	155

Identifying Superior Sires and Dams

Poultry breeder A knows full well that sire no. G10, whose mates' average was 264 eggs and daughters' average was 219 eggs, is greatly superior in breeding worth to sire no. G11, whose mates' average was 285 eggs and daughters' average was 163 eggs. Likewise, poultry breeder B, with his White Leghorns, would pick sire no. 1, whose mates and daughters averaged 283 and 243 eggs, respectively, over sire no. 5, whose mates and daughters averaged 255 and 152, respectively. B's Rhode Island Red sire no. 1 was mated to females that averaged 252 eggs and his daughters averaged 242 eggs whereas sire no. 5, although mated to females that averaged 270 eggs, had daughters that averaged only 165 eggs.

Although it has been pointed out previously that the ability to identify and make use of sires of superior breeding worth is of paramount importance in raising the level of egg production of the flocks of the country, nevertheless it is highly important to be able to identify a female of superior breeding worth, if for no other reason than to produce more superior sires.

The intelligent selection of breeding stock on a family basis, which is the essence of progeny testing, is the surest way of making progress in the development of foundation breeding stock and efficient laying strains.

Precisely the same principles apply in the selection of breeding stock for such characteristics as egg size, shell color, interior egg quality, hatchability of eggs, and viability of progeny.

It may be taken for granted that, for the most part, superior breeding stock can be developed only by a class of superior poultry breeders. In fact, the greatest need of the poultry industry is greatly increased numbers of poultry breeders who not only know how to raise and manage chickens properly but who have a sound knowledge of the more fundamental problems involved in the selection and mating of breeding stock. Superior breeding stock can be developed only through the adoption of a sound breeding program.

It must be a balanced program, combining high egg production, good rate of growth, good body size for the breed, efficient flesh production, eggs of good size and desirable interior quality, good fertility and hatchability, and low chick and pullet mortality. To accomplish these things with any degree of success is a formidable task. Since inheritance plays such an important role in the development of these numerous characteristics, it becomes apparent that numerous matings are necessary and the largest possible number of progeny should be kept to provide for the wisest selection of the most superior sons and daughters of the most superior sires and dams.

Poultry breeders must learn that the best breeders cannot be selected from their external appearance alone; it is the genes and certain hormones that count. For instance, the White Leghorn has white plumage because it carries a gene that prohibits the development of pigment. But the White Leghorn also carries the sex-linked gene for barring, as certain crosses have demonstrated. Now the average White Leghorn breeder would not suspect the presence of the sex-linked gene for barring in his stock, but it is there just the same. Then again the White Plymouth Rock carries a gene for the extension of black pigment to all parts of its plumage, but the bird is white because it lacks a certain gene for the production of pigment. And so it is with many breeds and varieties there is "more than meets the eye." Likewise with stock that is being bred for such characteristics as egg production, egg weight, and low mortality. Breeding tests tell the tale.

The poultry breeder should know how to measure the results he secured. Of course, he knows how to count the egg weights and bird weights, but he must be able to do much more than that in order to make the most progress. It is the average results that are secured from large families obtained from each mating that serve as the best measure in selecting superior sires and dams. Moreover, the breeding stock and their progeny should be kept under as uniform conditions as possible from year to year.

The production record, the pedigree, and the progeny test provide three means of identifying the dam of superior breeding worth. A superior sire is identified by the production record of his dam, his own pedigree, the average egg production of his full sisters, and the kind of progeny he produces. It can be said with a reasonable degree of certainty that in the present state of the poultry breeding industry of the United States, the selection of breeding stock on the basis of the progeny test is the most important step in the development of a balanced breeding program.

Future progress in poultry-breeding work will depend on the kind of poultry breeders that carry on the work. The chicken presents the possibilities upon the poultry breeders rest the responsibilities.

Fertilizing Capacity of Male Chickens in Natural Matings

By T. C. Byerly, and A. B. Godfrey,
Bureau of Animal Industry, U. S. Department of Agriculture.

Quantitative data on the capacity of male chickens for fertilizing eggs in natural matings are lacking. Practical poultrymen and standard texts[1] state empirically that a ratio of from one male to about 20 females for light breeds to a ratio of one male to about 10 females for the heaviest breeds will usually insure satisfactory fertility. There is need for objective data on the relationship between relative fertility and the ratio between the numbers of females and males in the matings to serve as a basis for special cases demanding the widest practical utilization of superior breeding males.

The present paper contains data for males mated with various numbers of females. The data were collected for the periods from April to August, inclusive, during 1935 and 1936 at the National Agricultural Research Center at Beltsville, Md. Post-hatching-season data were used because the breeding flocks were required for reproduction during the regular breeding season. In 1935, four pens of Light Sussex hens containing from 11 to 15 laying hens each and one pen of 65 Light Sussex laying pullets comprised the females used. Matings were made as follows: 4 males with one pen of hens; 2 males with one pen of hens; 1 male with one pen of hens; 1 male with two pens of hens; 1 male with the pen of pullets.

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[1] Jull, M. A., 1930. Poultry Husbandry. 639 pp., illus. McGraw-Hill Publishing Co., New York, N. Y.
Rice, J. E. and H. E. Botsford, 1930. Practical Poultry Management. 2d ed., 540 pp., illus. John Wiley & Sons, New York, N. Y.
Lippincott, W. A. and L. E. Card, 1934. Poultry Production. 5th ed., 723 pp., illus. Lea & Febiger, Philadelphia, Pa.

In 1936, two pens of Single Comb White Leghorn pullets containing 57 and 62 laying pullets respectively were mated, each to one Single Comb White Leghorn male. Two pens of Single Comb Rhode Island Red pullets containing 117 and 166 laying pullets respectively were mated, each to one Single Comb Rhode Island Red male. The Red males on these two pens were interchanged after 3 weeks and these matings were carried on for 3 more weeks. Fertility in each of the two pens for the two periods was practically identical.

Each of the Sussex and Leghorn matings was maintained for about six weeks. Two weeks elapsed between successive matings of the same females. Some or all eggs laid were incubated each week. Fertility was determined by breaking and examining the eggs after a week or more of incubation.

The data for relative fertility and for the number of females which laid fertile eggs are plotted against the number of laying females per male in each mating in the accompanying chart. Relative fertility dropped in linear fashion from a value of about 95 percent for Sussex matings with a ratio of 4 females to 1 male to a value of about 35 percent for 166 Single Comb Rhode Island Red females mated to a single male.

The number of females which laid fertile eggs rose in approximately linear fashion as the number of females per male increased. Of the 65 laying pullets mated to a single Light Sussex male, 62 laid some fertile eggs. Of the 166 Single Comb Rhode Island Red females mated to a Single Comb Rhode Island Rdd male, 137 laid some fertile eggs.

On a basis of the data presented in chart 1, the weekly chick production of a single male would behave as follows. The absolute number of chicks would, of course, depend on percentage hatch of fertile eggs and percentage egg production as well as percentage fertility. Assuming 60 percent egg production and 80 percent hatch of fertile eggs, a male mated with 20 females would produce 68 chicks per week if 90 percent fertility were obtained as indicated for 20 females per male by the relative fertility curve in chart 1.

The same male would produce about 225 chicks per week if mated to 100 similar females with the same hatchability of fertile eggs, since the relative fertility curve in chart 1 indicates about 60 percent fertility for a mating of 100 females to one male. The increase in number of chicks produced would be accompanied by an increase in egg cost per chick in the 100; 1 mating to a value about 50 percent greater than the egg cost per chick for the 20: 1 mating. Seventy-two percent of eggs set would hatch under the assumption for the 20:1 mating and only 48 percent under the assumption for the 100: 1 mating.

These simple and very obvious deductions are stated only as an example of the calculations necessary for any breeder to decide whether increased number of chicks per male, through increasing the number of females per male, is justified in his case or not. The fertilizing capacity of different males is known to vary widely. The capacity of an individual male will vary with climatic conditions, age, and health. The data presented in the present paper should be extended by objective data from other workers.

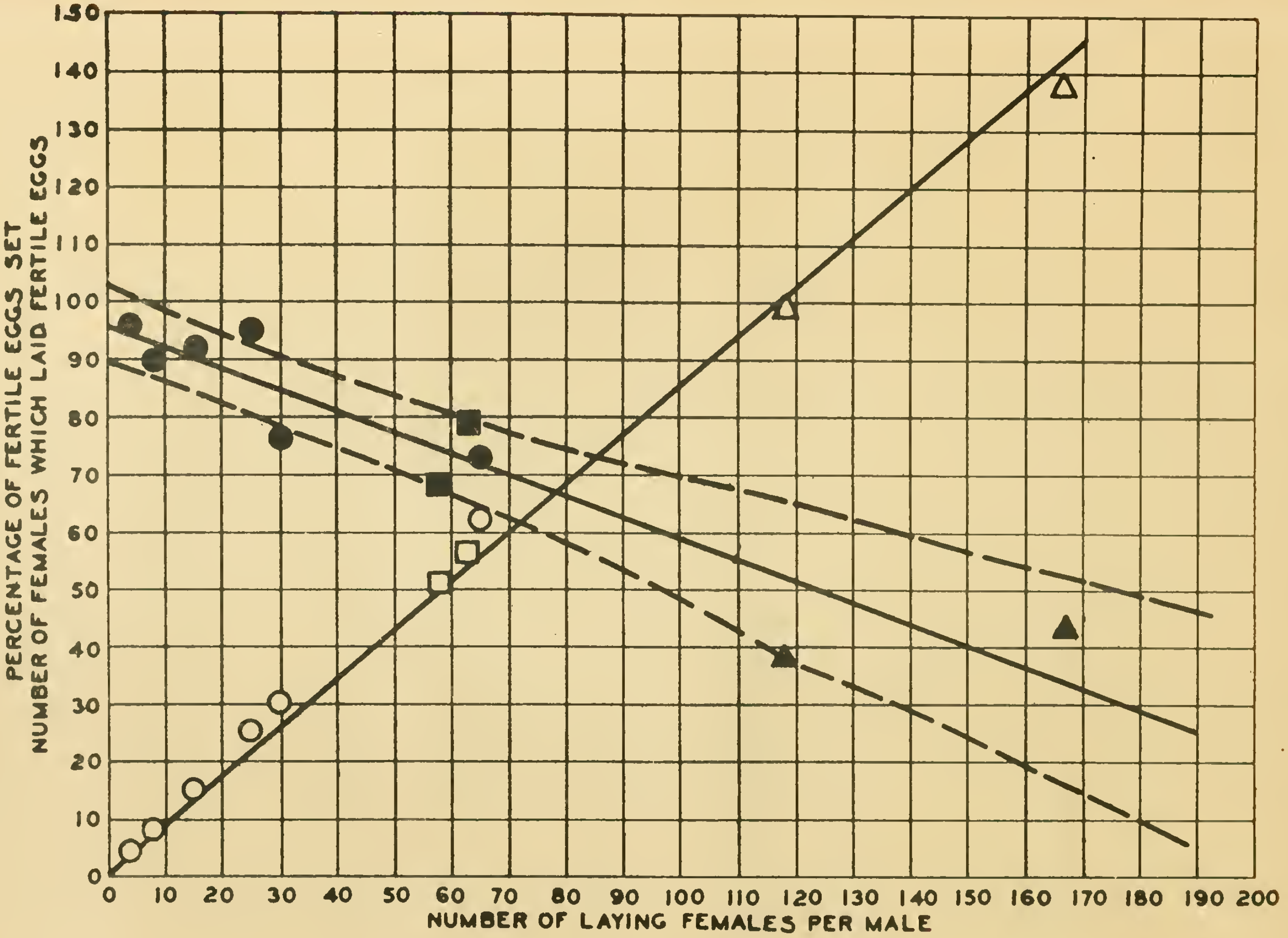

CHART NO. 1

Relative fertility[1] and number of females which laid fertile eggs in relation to the number of laying females mated to one male. Solid symbols – relative fertility; open symbols – number of females whose eggs were fertilized; disks, Light Sussex matings; squares, Single Comb White Leghorn matings; triangles, Single Rhode Island Red matings.

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[1] The curve for relative fertility was determined by method of least squares for the formula Y = AX + B in which Y = relative fertility, X = number of females per male and A and B are constants. The values for the constants are A = $^{-}$0.369±0.0655 and B = $^{+}$95.55±3.38. The broken curves plotted above and beneath the curve for relative fertility describe the limits of the area including twice the standard error on each side of the curve. Only two observed points fell outside this area.

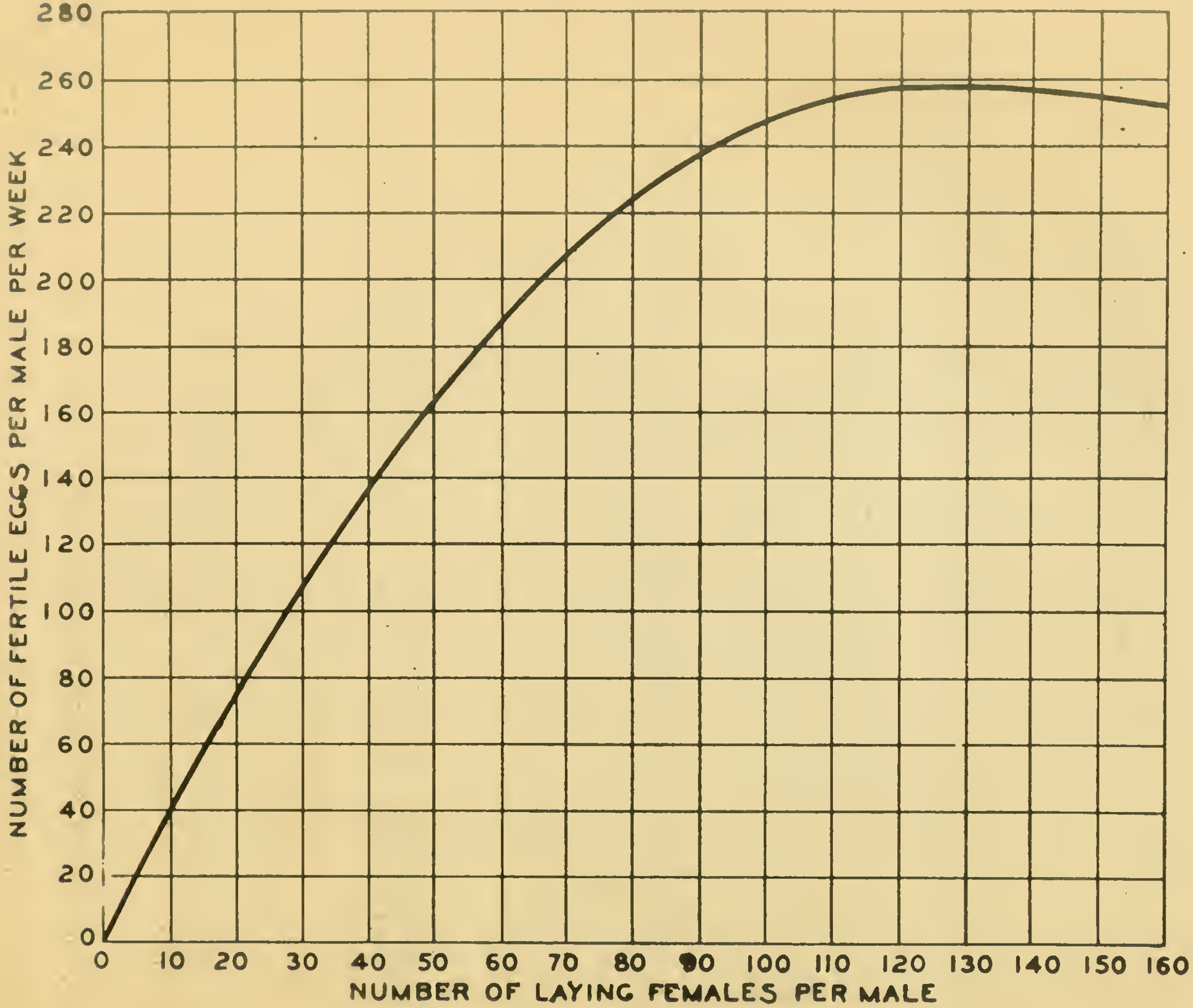


CHART NO. 2

Number of fertile eggs per week per male plotted against number of laying females per male. Production of 60 percent was assumed.

The curve in the accompanying chart is calculated from the values read from the relative fertility curve plotted in chart 1. An egg production of 60 percent was assumed in making the calculations. These calculations indicate that as many fertile eggs would be obtained from 120 laying females mated to one male as from a larger

Summary

Relative fertility fell in linear fashion as the number of females per male was increased from a value of 95 percent for a ratio of 4 females to 1 male to a value of about 35 percent for a ratio of 165 females to 1 male. Matings of Light Sussex, Single Comb White Leghorn and Single Comb Rhode Island Red birds were used.

The number of hens which laid fertile eggs increased in linear fashion over the same range.

Calculations based on the data indicate that the maximum number of fertile eggs from a single male would be obtained by mating that male to about 120 laying females.

RECORD FORMS FOR PROGENY TESTING

By J. M. Moore, extension poultryman, Michigan State College, and secretary, Michigan Poultry Improvement Association, East Lansing, Mich.

Progeny testing is the evaluation of poultry breeding practices obtained by the average production of families rather than from records made by individuals to determine the breeding value of the parents. In order that the poultry breeder may use progeny testing effectively it is imperative that he keep individual records that are correct and that can be referred to without loss of time. As the life of the modern hen is all too short, he has to refer to many birds that are already dead before their breeding value has been determined. To do this he must provide suitable record forms that are permanent, that can be preserved and that are as condensed as possible. The poultry breeder who has a large number of birds under trap nest soon acquires a large number of different records. In looking backward, for even two years, he will often find it difficult to determine the performance of certain birds which have only now proved to be valuable.

Following five years' experience in this work, four progeny testing forms were drawn up and approved by the Michigan Record of Performance Association at its annual meeting in 1935. These forms were then printed and distributed to each breeder with a suitable cover to keep them together and to preserve them. These four forms are numbered 1, 2, 3, and 4. All forms are of the same size, 11 by 17 inches. They are kept in a loose-leaf binder. The type of binder costs about $2.30 and is supplied free by the R. O. P. association to each member but remains the property of the association.

Form 1 is a permanent record which carries the monthly egg records, egg weights, body weights, and approved numbers of 40 candidates on each sheet. Starting at the left-hand column and moving toward the right each column is as follows: Trap-nest leg-band number, wing-band number, U.S R.O.P. number of dam, body weight of the candidate at age of first egg, date on which she was hatched and a space for date of first egg. There is a column for number of eggs and egg weights for each month, a column between March and April and between July and August for recording body weights. An average of these two weights will be the mature weight of each bird. The

R. O. P. No. 1

PERMANENT EGG RECORD

POULTRY DEPARTMENT
MICHIGAN STATE COLLEGE
EXTENSION SERVICE

Breeder's Name John Smith Breed SCW Leghorns Year 1935-36

Leg Band	Wing Band	Dam No.	Pen No.	Body Wgt.	Hatched	August	Weight	September	Weight	October	Weight	November	Weight	December	Weight	January	Weight	February	Weight	Total	Total Wgt.	March	Weight	Body Wgt.	April	Weight	May	Weight	June	Weight	July	Weight	Body Wgt	August	Weight	September	Weight	October	Weight	November	Weight	Record	Egg Wgt.	Body Wgt.	App. No.
1	384	D997	4	3.7	3-/16			19/8		25		19		3		20	2+/3	16	1+/3			18		4.5	22	3+/10	22	3+/13	21	3+/7	20	4+/6	4.7	19	3+/8	13	2+/5					226	24+/55	4.6	H2011
2	596	D842	2	3.5	3-/23			20/8		30		25		13		24	2+/1	24	2+/2			28	3+/6	4.2	27	3+/8	27	2+/8	24	3+/8	22	2+/5	4.0	25	2+/5	17	2+/5					294	21+/48	4.1	H2066
3	211	D792	6	3.8	3-/9			22/6		22		22		3		12	1-/1	17	2+/1			23	4+/2	4.6	Died April 6.																				
4	1040	D840	2	3.4	3-/30			20/9		25		24		20		22	2-/6	2	1-/3			16	1-/1	4.4	25	3-/5	23	3-/6	1	1-/3	Culled June 25														
5	455	E1060	6	3.2	3-/16			18/8						9		24	2-/3	21	2-/2			19	2-/3	4.0	21	2-/3	22	3-/9	21	2-/4	19	2-/3		22	2-/5	3	2-/4					189	19-/36	4.1	
6	490	D840	2	4.3	3-/16			19/10		23		6		6		21	2+/1	18	2-/3			21	1+/1	5.2	18	3-/1	12	2-/1	2	1+/2			5.0									137	11-/1	5.1	
7	512	E1262	3	3.8	3-/23			18/4						6		16	2+/3	22	2+/8			26	3+/11	4.6	24	3+/12	23	3+/3	23	4+/8	25	4+/9	4.7	24	3+/6	15	3+/4					208	27+/64	4.6	H2103
8	617	E1394	5	3.1	3-/23			18/4		4				15		19	1+/0	22	4+/7			22	2+/3	3.9	18	2+/5	24	1-/4	24	3+/5	21	3+/11	4.3	23	2+/7	15	2+/6					211	20+/40	4.1	H2015
9	312	D792	6	3.5	3-/16			21/8		26		21		22		13	1+/0	9	1+/0			Died Feb 23.																							
10	245	D878	4	3.8	3-/9			10/9		25		24		23		27	3-/7	22	3-/4			24	3-/3	4.7	21	3-/4	21	2-/4	22	3-/4	22	3-/7	4.2	22	3-/6	6	2-/4					268	25-/43	4.4	
11	849	E1122	9	3.5	3-/30			18/9		24		25		23		25	2+/0	26	3+/2			27	3+/9	4.3	16	2+/4	15	2+/3	18	1+/3	26	3+/6	4.5	23	2+/6	15	2+/6					272	20+/39	4.4	H2113
12	726	F1526	5	3.0	3-/23			20/9		24		20		23		25	3+/8	20	2+/6			25	3+/12	3.7	24	3+/13	24	3+/12	14	2+/6	21	3+/15	3.9	20		17	2+/7					266	2+/79	3.8	H2073
13	394	F1661	5	3.7	3-/16			19/7		21		16				6		2				21	3-/1	4.8	23	3-/1	8	3+/1	23	2-/1	17	2-/2	4.6	12	1-/1	Died Aug. 23.									
14	346	C336	8	3.8	3-/16			20/4		19		20		10		18	1-/1	24	3+/2			25	3+/3	5.2	18	2-/2	21	3+/1	20	1+/0	24	3+/1	5.2	26	3+/0	18	3+/0					247	22+/4	5.2	H2054
15	221	D821	4	4.1	3-/9			20/6		21		23		25		19	3-/6	22	4+/1			23	2+/1	5.5	14		20	3-/1	23	1-/4	24	3+/4	5.0	24	2+/3	15	2+/4					259	20+/2	5.2	H2031
16	436	E1122	9	3.7	3-/16			28/3		24		25		12		24	2+/2	24	4+/5			25	3+/5	4.5	24	3+/6	25	4+/8	23	1+/2	22	2+/2	4.5	20	1+/1	18	2+/3					269	22+/34	4.5	H2062
17	546	D842	2	3.6	3-/23			22/8		26		23		23		22	1+/0	14	2-/1			17		4.4	17	2+/5	17	2+/6	13	2+/4	7	1+/4	4.2	4		2						193	10+/18	4.3	
18	465	E1060	6	3.9	3-/16			20/9		27		2				9		1		Died March 15-																									
19	654	C336	8	3.2	3-/23			23/7		24		22		22		15		10	2+/1			22	2-/3	4.2	15	2+/2	14	4+/0	5		11		4.0	23	2-/1	21	2-/4					211	14-/5	4.1	
20	791	D878	4	3.0	3-/23			24/5		21		24		20		18	2+/1	24	3+/6			25	2+/4	3.8	26	3+/5	27	3+/8	22	3+/10	21	2+/6	3.6	24	3+/6	15	3+/4					272	24+/50	3.7	H2039
21	917	E1404	9	3.4	3-/30			26/1						4		6		3		Died Feb 26.																									
22	2314	C386	8	4.1	4-/20			29/2		26		23		22		20	1+/0	2	2+/2			16	1+/0	4.6	12	3+/4	Died May 2.																		
23	2119	C336	8	3.8	4-/20			30/1		27		10		23		17	2+/1	22	2-/3			25	2+/0	4.4	23	3+/3	25	4+/1	25	3+/0	22	3+/3	4.6	20	3+/2	22	3+/4					262	23+/11	4.5	H2051
24	1650	D840	2	3.3	4-/6					1/23		25		27		10		23	2-/6			22	3-/7	3.8	26	3-/3	27	3-/4	26	3-/2	25	3-/4	4.2	18	3-/1	21	3-/5					273	23-/32	4.0	
25	1237	E1060	6	3.1	4-/6					1/14		20		18		17		20	2+/1			13	3+/1	3.8	15	3-/3	10	2+/5	3		6		Culled July 25.												
26	2371	F1526	5	3.6	4-/20					2/21		23		24		20		16	2-/3			17	2-/5	4.2	23	3-/4	26	3+/1	27	3+/4	21	3+/6	4.6	20	3+/6	21	3+/0					262	22+/5	4.4	H2120
27	1723	D821	4	3.4	4-/6					3/18		15		16		17	3-/4	19	3-/3			20	3-/6	4.6	21	2+/0	22	3+/3	24	3+/4	23	3+/0	4.6	16	2+/2	15	3+/6	1	1+/0			227	26+/2	4.6	H2046
28	1437	C401	8	3.8	4-/6					4/20		27		26		15	3+/2	24	2-/4			25	2+/0	4.6	23	3+/1	27	3+/3	20	3+/4	18	3+/0	4.3	17	2-/2	15	2+/1					257	23+/5	4.4	H2003
29	1374	C336	8	3.9	4-/6					4/16		4		18		15		Died Jan 15.						4																					
30	1743	F1661	5	3.2	4-/13					5/12		13		10		6	3-/10	5	2-/4			10		4.0	15	3-/1	18	3+/0	10		Culled July 25														
31	925	D878	4	3.0	3-/23					5/16		24		21		20	3-/3	23	3-/4			26	3+/0	3.7	27	2+/3	29	3+/5	25	3+/2	20	3-/2	4.1	23	3+/1	14	2+/2	2	2+/4			270	27+/8	3.9	H2089
32	259	D821	4	2.9	3-/9					12/13		23		12		6								3.6	20	1+/1	20	1+/1	21	3+/2	Died July 3.														
33	331	E1394	9	3.7	3-/16					16/10		24		21		22	3-/12	18	3-/6			16	3-/2	4.2	24	3+/1	26	3+/2	25	3+/4	23	3+/0	4.0	20	2+/1	21	3+/4	10	3+/5			260	29-/4	4.1	
34	467	E1060	6	3.8	3-/16					17/5		15		18		17	3-/6	16	2-/5			4		4.5	23	3+/3	22	3-/1	14	2+/4	10		Culled Aug 1.												
35	746	E1122	9	3.6	3-/23					17/4		13		4		Died Dec. 20.																													
36	923	D997	4	3.4	3-/30					26/3		14		16		23	3-/4	21	3-/2			16		4.2	23	2+/1	24	3+/5	20	2+/1	23	3-/2	4.2	15		20	3+/7	11	2+/4			229	21+/10	4.2	H2036
37	392	D792	6	2.9	3-/16					22/2		12				6		15	1-/4	Died March 9																									
38	1675	E1364	9	3.5	4-/6							1/15		20		23	3-/12	26	3-/9			25	3-/6	4.0	26	3-/3	27	3-/1	25	3-/4	20	2+/1	4.2	18		15	2+/2	4	1-/3			244	23-/35	4.1	
39	1576	C401	8	3.7	3-/30							2/21		24		22	3-/6	20	2-/8			26	3-/4	4.1	27	3-/2	29	3+/4	21	3+/0	18	2+/4	4.4	20	3-/6	14						242	22-/18	4.2	
40	1439	D821	4	3.6	3-/30							3/20		23		20	1-/1	2						Died March 6-																					

HATCHABILITY RECORD

POULTRY DEPARTMENT
MICHIGAN STATE COLLEGE
EXTENSION SERVICE

Breeder's Name John Smith Breed S.C.W. Leghorns Year 1934

Mating No. 2 1934

Male No. E540

Date of Hatch	Hen No. D189			Hen No. D945			Hen No. D960			Hen No. D982			Hen No. E1060			Hen No. E1089		
	Set	Fertile	Hatched	Set	Fertile	Hatched	Set	Fertile	Hatched	Set	Fertile	Hatched	Set	Fertile	Hatched	Set	Fertile	Hatched
March 2	9	7	5				8	6	5	5	4	3	9	7	6	7	6	4
9	4	4	4	3	3	2	5	4	3	4	4	3	3	3	3	5	5	4
16	5	4	3	4	3	3	6	5	4	3	3	3	6	5	4	2	2	2
23	3	3	3	2	2	2	4	4	4	4	3	2	5	4	4			
30	5	4	4	5	3	2	4	3	2	4	3	1	4	4	3	3	2	2
April 6	4	3	2	1	1	0	5	3	3	3	3	3	4	4	3	2	2	2
13	3	3	3	4	2	2	6	5	4	5	3	3	3	2	2	1	0	0
20	4	3	2	2	2	1	5	5	5	2	2	2	4	3	2	3	3	3
27	4	3	2	5	5	3	5	5	4	1	0	0	2	2	2	2	2	1
May 4	2	2	2	3	3	2	4	3	2	4	3	1	5	5	4	3	2	2
11	2	1	0	3	2	2	2	2	1	4	4	3	4	3	3	2	2	2
16				3	3	2	3	2	2	5	3	2	2	2	2	2	2	2
25				1	1	1	3	3	2	3	3	3	1	1	1			
Total	45	37	30	36	30	22	60	50	41	47	38	29	52	45	39	32	28	24

Date of Hatch	Hen No. E1120			Hen No. E1136			Hen No. E1206			Hen No. E1209			Hen No. E1221		
	Set	Fertile	Hatched	Set	Fertile	Hatched	Set	Fertile	Hatched	Set	Fertile	Hatched	Set	Fertile	Hatched
March 2	4	4	3												
9	3	1	1				2	2	2				3	3	2
16	4	1	0	3	2	2	3	3	2	3	2	2	2	2	2
23	3	2	2	2	2	1	3	3	3	2	1	1	4	3	1
30	4	2	1	3	1	1	4	4	3	3	2	2	3	3	3
April 6	5	3	2	4	3	2	3	2	2	3	1	0	4	3	3
13	4	1	1	5	4	3	5	4	3	2	0	0	5	4	4
20	3	2	2	3	2	2	6	4	4	1	0	0	3	3	3
27	6	2	1	2	2	2	4	3	3				2	1	1
May 4	4	1	1	2	2	2	2	2	2				3	2	2
11	3	1	0	3	2	2	3	2	2				2	2	2
16	2	0					2	2	1				2	1	1
25	2	0					1	1	0						
Total	47	20	14	27	20	17	38	32	27	14	6	5	33	27	24

R. O. P. No. 3

HEN PROGENY RECORD

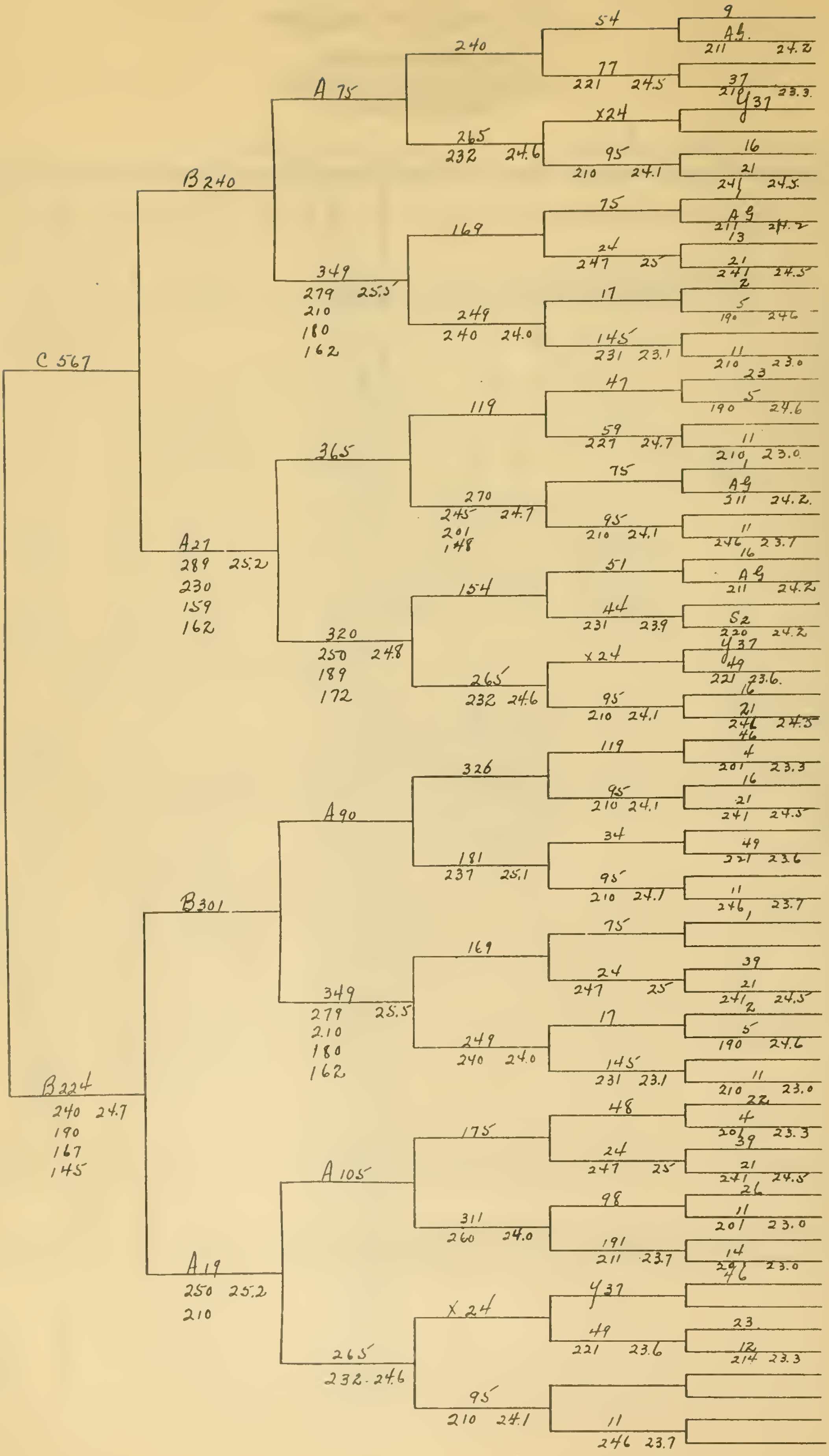
POULTRY DEPARTMENT
MICHIGAN STATE COLLEGE
EXTENSION SERVICE

Breeder's Name John Smith. **Breed** S.C.W. Leghorns **Year** 19___

Body Weight Initial	Body Weight Mature	Wing Band	Hatched	Date of first Egg	Age at first Egg	Year	Color of Egg	Shell Texture	Shape	Bird Number
3.2	4.4	C 2374	4-20 1931	9-24-31	157 days	1	White	Fair	Good	D889
						2	"	Fair	"	
						3	"	Poor	Fair	Died 10-16 1935

Year	Record	Egg Wgt.	Eggs Set	Fertile	Chicks Hatched	Percentage Hatched	Year	Mating Number	Sire Number	Dam of Sire	Sire's Dam Record	Sire's Dam Egg Wgt.	Good Pullets Matured
1st —	271	25.2					1932						
2nd	212		60	55	47	85.5	1933	5	E 721	C 336	265	25.8	16
3rd	157		45	37	30	81.	1934	2	E 540	B 46	251	25.2	12
4th	162		34	25	17	68.	1935	1	E 540	B 46	251	25.2	7
5th							19___						
6th							19___						

	1933 Daught'r No.	Record	Egg Weight	Date Culled	Date Died	1934 Daught'r No.	Record	Egg Weight	Date Culled	Date Died	1935 Daught'r No.	Record	Egg Weight	Date Culled	Date Died	19___ Daught'r No.	Record	Egg Weight	Date Culled	Date Died	19___ Daught'r No.	Record	Egg Weight	Date Culled	Date Died
	12	182	24.2			16	190	24.5			226				June 4										
	76			Jan 6		91	178	25.1			291	211	26.7												
	49	211	23.1			210	230	24.2			314	201	24.0												
	108				Mar 4	244				Jan 4	372	225	23.7												
	190	127	22.6			269	245	23.7			455	214	24.5												
	310				Nov 10	310	211	24.5			489	170	22.5												
	365	166	23.5			316	225	25.6			623	236	25.1												
	368			Jan 6		408				Aug 8															
	410	220	23.0			439	219	24.6																	
	431	216	25.1			520	240	23.0																	
	459			Aug 3		539	250	24.2																	
	472	229	24.7			644	209	22.7																	
	490				June 5																				
	523	147	24.1																						
	560				July 6																				
	620	231	24.5																						
Total	16	1728	214.8			12	2197	2421			7	1257	1465												
Number		9		3	4		10		0	2		6		0											
Average		192	23.9				219.7	24.2				209.5	24.4												
% Qualifying	18.7					41.7					57.1														


C 567
B 240
A 75
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R. O. P. No. 4

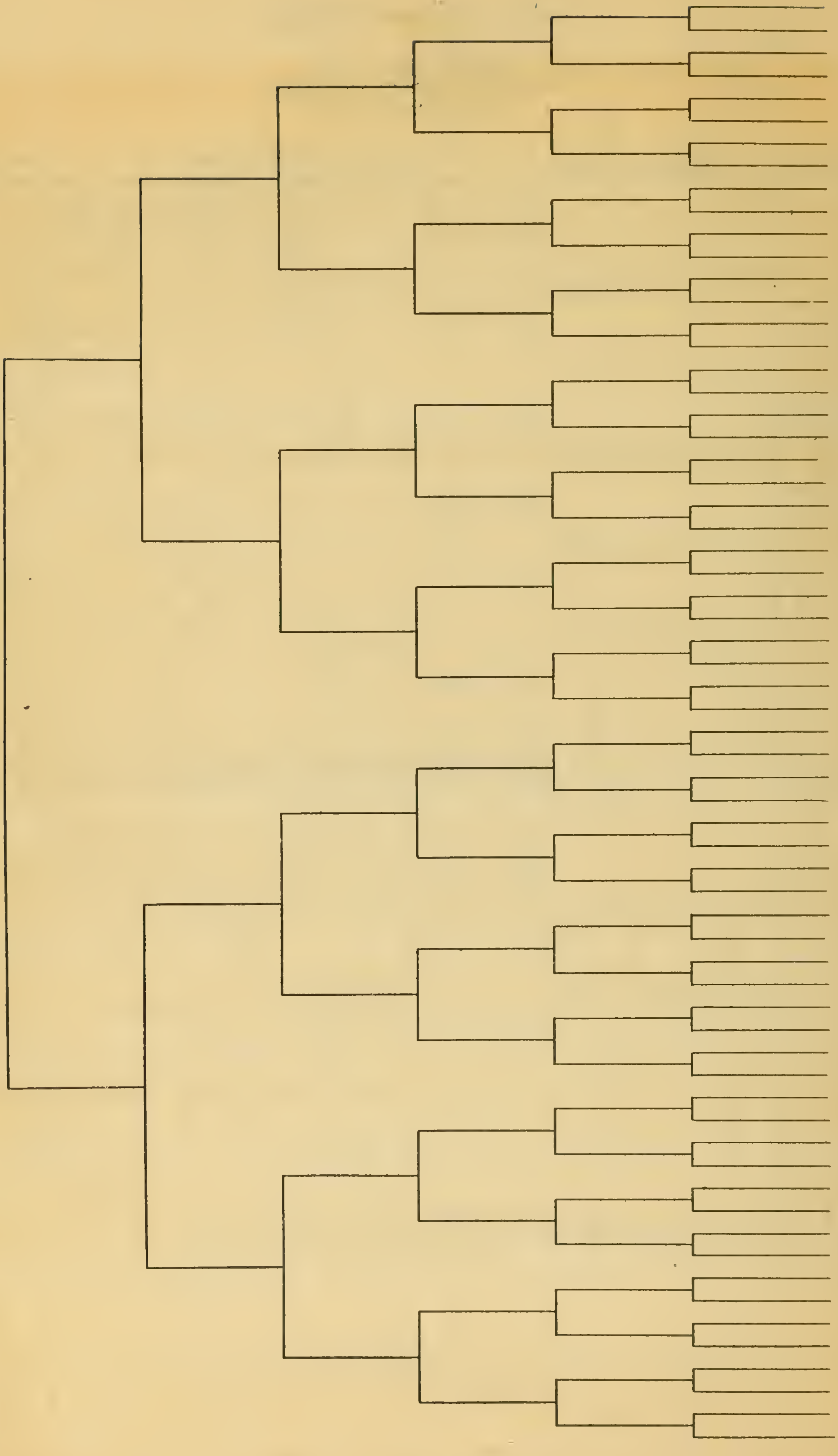
MALE PROGENY RECORD

POULTRY DEPARTMENT
MICHIGAN STATE COLLEGE
EXTENSION SERVICE

Breeder's Name John Smith Breed S.C.W. Leghorns Year 1934

Mating No. 2 1934 Male No. E540

Hen No.	Total Eggs Set	Total Eggs Fertile	Total Chicks Hatched	Daughters put in Laying House	Daughters Finishing Year	Total Egg Production	Total Egg Weight	Daughters Culled	Daughters Died	Total Body Weight
D889	45	37	30	12	10	2197	242.1	0	2	
D945	36	30	22	7	4	831	94.2	2	1	
D960	60	50	41	16	10	1969	239.4	3	3	
D982	47	38	29	12	7	1478	174.6	1	4	
E1060	52	45	39	12	5	906	131.2	5	2	
E1089	32	28	24	10	9	1404	229.4		1	
E1120	47	20	14	4	2	384	47.0	1	1	
E1136	27	20	17	6	4	726	99.2		2	
E1206	38	32	27	9	6	1305	140.2	2	1	
E1209	14	6	5	2	0				2	
E1221	33	27	24	9	6	1272	137.4	1	2	
Total	431	333	272	99	63	12472	1534.7	15	21	
Average	39.2	30.3	24.7	9	5.7	198	24.4	1.4	1.9	
Per cent			81.7		63.6					



last three columns at the right-hand side provide for the final record, the final egg weight and the U.S.R.O.P. or approved number of the candidate. There are eight blank columns to the extreme right of the page for any breeder who wishes to add any further information which he may wish to collect.

Form 2 is a hatchability record. It provides for the hatching record of 18 hens for 20 different hatching dates. It also records the mating number of the pen and the number of the male which heads the pen. There are three columns for each hen - one for the number of eggs set, one for the number of fertile eggs and one for the number of chicks hatched. This record is for use during the hatching season. When the breeder has some spare time he can transfer the hatchability record of each hen he is interested in to Form 3 and of each male to Form 4.

Form 3 is the individual record of each hen and contains as much information as most poultrymen could wish for. Two years ago when these forms were made many thought this form too elaborate. Even yet some Michigan breeders are not filling it in fully while others would like some additional information added to it. All the space was filled to make this record as complete as possible. On the reverse side of the sheet there is an extended pedigree of the bird going back for six generations. On the front side at the upper right-hand corner there is a space for the number of the bird. This number should be the permanent U.S.R.O.P. number whenever possible. Immediately below this space is another for the date of the death of the bird. On the same line at the left-hand side is a space for the initial weight of the pullet when she lays her first egg. This is followed by a description of the type of egg which the bird lays. This information may be taken the first, second, or third year of production or all of them. For those who care to use an egg-quality record they will find it to be of great value in improving the quality of eggs produced in the later generations. At the left of the sheet below the top line there is space for the annual egg production and egg weight of the bird, her hatchability record, the mating number, the male to which she was mated, his dam's record and the number of matured pullets which resulted from this mating.

Below the annual egg record of the bird we have the record of her daughters under trap nest, their egg records and egg weights and their mortality record. One important point should be emphasized. Usually the dam of the pullet can easily be determined but often the sire of that pullet is in doubt. If the year of the mating and the year in which the daughters begin their records are kept correctly on this form this information can always be obtained correctly.

Form 4 is the male progeny record. In order to distinguish number 4 from the other forms it has been made of a different colored paper. This record shows the mating number, the year, and the male's number at the top of the page. On the back of the sheet there is an extended pedigree of the male for six generations similar to the individual hen record on number 3. On the front side on the left-hand side of this form there are 16 spaces for the different hens the male was mated to that year. The hatchability record of the male can be obtained from form 2. The number of daughters put in the laying house, their records, and their disposal (whether culled or died) can be obtained from form 3.

I have endeavored to explain the progeny-testing forms which we have used in Michigan during the past two years. Our R.O.P. breeders like them. They fit in well with the type of daily trap-nest sheets and pedigree records that we are using. From our experience these forms have been successful because they are permanent. They are all kept in one book and are not easily lost and are readily available for use at any time. All R.O.P. breeders must progeny test if they expect to do constructive breeding work. These forms have helped Michigan breeders to obtain more definite information regarding the comparative value of different families they are interested in. This has helped them to produce better breeding stock.

MY EXPERIENCE IN OPERATING A U.S. APPROVED, PULLORUM-TESTED HATCHERY

By D.D. Slade, hatchery operator, director, Kentucky
Poultry Improvement Association, and president,
Kentucky Baby Chick Association, Lexington, Ky.

May I, at the outset, say that I am personally gratified with the sound judgment that was used in laying out the National Poultry Improvement Plan, which has made it possible for a hatchery to come in under this plan with a reasonable minimum of poultry improvement work. This to my mind is one of the outstanding features and should be guarded very carefully to see that a sufficient amount of improvement work is carried through to a satisfactory culmination so as to allow hatcheries to come into the plan without having to revolutionize their methods and yet keep the plan on a high enough basis so that there is a distinct improvement program followed.

In Kentucky one of the requirements of the Kentucky Poultry Improvement Association is that a U.S. Approved hatchery must also have blood testing done along with the breed improvement work. After working with the plan from its inception, we feel that this has been a very satisfactory stand. Therefore, we are very glad that this was incorporated in the poultry improvement plan of the State to start out with. We feel that we have accomplished considerable in the improvement work of the flocks that are furnishing eggs to the hatcheries.

Let me go into some detail with reference to the handling and operation of this plan in our own hatchery. In the first place, every summer before the culling season begins, the men who do our culling work attend a short course offered by the University of Kentucky. This includes the men who have attended in former years as well as any of those that have never attended before. We feel that regular attendance at these courses is necessary even though the men have been in our employ and attending these courses for several years.

Beginning about the first of August, we start our culling and educational work, although during August very little actual culling is done. About the only advantage in starting this early is that the men are in the field contacting those that are going to have the culling work done. Then the first of September we start our culling work in earnest. Every bird on the entire place is handled, of course, either being culled out or banded and blood tested. The culls and reactors are removed from the premises immediately. At this time, too, undeveloped birds are eliminated. We have enough flocks so that when we have a ten percent reaction or over, unless it runs in a really outstanding flock, no attempt is made to go back and retest the flock; it is simply discarded. The owners of these are told that if cleaning up is done and the flock gotten into proper shape before the next season, we might be able to do this blood testing for them next year and that it might be possible then to add them to our list of flocks.

The first of January when we have completed culling and testing, a card is made out and filed for each flock owner. These cards have on them the number of hens in the flock, the grade of the flock, the number of dozen hatching eggs received from it, the date they are received, and the percentage of hatch. I might emphasize at this point the necessity for keeping up to date the posting of the hatch that comes from each one of these bunches of eggs. We have found this to be one of the most important things we have done, because it enables us in the spring to discontinue flocks that are not coming up to our required standards for hatching eggs. It is information that is well worth recording and studying. Of course it does take some time to do this although not so much as a person would at first think.

We are one of those parties who sell two grades of U.S. Approved, Pullorum-Tested chicks of the same breed, and I realize that this practice can be abused, just as well as anybody. When the eggs are received from the various flock owners they are placed on trays containing one or the other of two color cards, pink and white. The white cards are used to designate our lowest grade; while the pink cards are placed on the trays containing our next higher grade. We have three incubator rooms, two containing four incubators each, and the third one incubator. All of the eggs on the white card trays, or the lower grade chicks, are set in what we call the rear room; all of the grade above that are set in a different room entirely. Both grades of chicks when they come out are handled in different places in our shipping room. This enables us to fill our orders for the different grades without getting them mixed. As I have said before, this method of handling can be abused, but I still say that any man who abuses this does so at the risk of losing his own business. Furthermore, it is an unethical practice to fill orders out of the lower grade when a customer has paid for the best grade.

Of course no custom hatching is done in our place unless it is from blood tested stock. We do not even take the word of the party coming in with the custom hatching; he must tell us who has done this blood testing and then we can easily check whether or not he is telling the truth.

This method that we are following is a good one and we intend to keep it up. We formerly used two and one-half to three Smith incubators full of custom hatching throughout the entire season and returns from that amounted to anywhere from $4,000 to $4,500 annually. Recently the returns from custom hatching have been approximately only $350 annually.

Along in 1924 and 1926 when we were hatching from two million to three million chicks each year, all that was necessary was for a fellow to say that he had purebred stock and then we would verify that from the county agent in his county or we could take somebody else's word for it, and we would go ahead and take the eggs. At that time this seemed to be a very good plan even though we were selling the chicks for $15.00 per hundred. At that time we were getting about 62 1/2 to 63 percent hatch for the entire season. Our hatches increased in 1928 to 64 percent and in 1929 to 64 1/2 percent. We felt that we were making improvements, because we were getting a little bit more careful with reference to the flocks from which we were taking our eggs. We started to do a little bit more selection work, but we did not start to blood test all of the flocks until the fall of 1930, at which time our total number of flocks from which we secured hatching eggs was about 320 where formerly our total number of flocks ran up to as high as 1,300. From then on, that is, from the time that we had our 320, we have gradually increased until, at the present time, we are running about 600 flocks. Our hatching capacity is one-half our former capacity.

Our hatchability has increased yearly. Needless to say in the last two years we have been exceedingly careful and have tried to impress on our flock owners the necessity for this poultry improvement work, requiring each of them to secure from us as a breeding flock nucleus a few chicks from eggs bought from the very best breeders in the United States, all of them R.O.P. breeders. We secure these eggs in large quantities and hatch them during the month of March; then the flock owner can secure the chicks at the rate of something like 25, 50, 75, or even 100 for the largest flocks. Of course we lose on putting these chicks out, because the eggs cost us 20 cents apiece and we sell the chicks to the flock owners for but 16 cents apiece. We are convinced, however, that we are getting a better grade of chicks, a better grade of eggs, and a better grade of flocks. We feel that this poultry improvement work we have undertaken in buying eggs from outstanding breeders, hatching them, and selling the chicks to our flock owners might take a long time to get up to the high standard we have set for ourselves, but we feel that we are getting somewhere, and we can already observe the improvement. These efforts have brought our hatchability up until this year our average for all eggs set is slightly over 74 percent.

The grading of the flocks is done by the culling men employed by us. This grade is confirmed when our men go out in the fall of the year and in January to visit these flocks and verify the grade that has been given them by the State culling inspector. This sets up the grade for the entire spring season.

I hope that I have not bored you with too much of I's and we's, but I have felt that to give you definite details as to what we have been doing and how we have been handling things would be of more interest to you than to make any attempt to give you an inspirational talk on the advantage of the National Poultry Improvement Plan to a hatcheryman. Needless to say we are enthusiastic about the improvement plan and would not go back to our old methods. Even though the cost is running up considerably in doing the culling and blood testing work, we feel it is money well spent. We know that we are putting out a better chick than we ever have before.

THE RELATIONSHIP BETWEEN THE AGRICULTURAL EXTENSION SERVICE AND THE NATIONAL POULTRY IMPROVEMENT PLAN.

By

H. L. Shrader, senior extension poultry
husbandman, U. S. Department of Agriculture.

Last year at this national conference on the Poultry Improvement Plan I had the pleasure of discussing how the Extension Service of the United States Department of Agriculture could serve most effectively in your program. Today your committee has suggested that I discuss the relationship between the Extension Service and the Poultry Improvement Plan. The term "relationship" implies family ties and quite properly so in this case, for we both belong to the Department of Agriculture family. I doubt if a skilled genealogist could give you the exact relationship, but judging from the time spent and interest taken in the plan by the extension poultry specialists I might call it a big-brother relationship. The only exception to this attitude could be found in States that are not represented here, where the plan has been greatly criticized and treated like a neglected step-child or an unwelcome orphan.

The objectives of the National Poultry Improvement Plan, as stated in the introduction are to "Identify authoritatively poultry breeding stock, hatching eggs and chicks with respect to quality by describing them in terms uniformly accepted in all parts of the country. The adoption of this plan should ultimately make poultry production more efficient, thereby making poultry raising more profitable and bring about an improvement in the quality of hatching eggs, baby chicks, breeding stock and market products."

The Secretary of Agriculture has designated the Bureau of Animal Industry to administer the plan. This Bureau conducts numerous lines of research work and also performs regulatory duties authorized by various acts of Congress. The Extension Service functions as an educational service and is instructed to "diffuse useful and practical information on subjects relating to agriculture."

The Poultry Improvement Plan, in promulgating a uniform terminology, gives the Extension Service a very useful standard as a basis for a quality products campaign. The plan sets out specifications in breeding and disease control that have long been needed by the industry. The Extension Service cannot and should not go out and sell U. S. Certified or U. S. Pullorum Clean chicks for some certain breeder. Its job lies in developing the want for stock of that quality. Its field lies in selling the idea that stock produced under supervision with known breeding methods is superior to that produced with nondescript breeding. One poultry specialist says he does not hesitate to recommend chicks which are produced under supervised breeding over those hatched for "multiplication purposes only."

The Extension Service has been helpful in compiling and distributing lists of flock owners and hatcheries that are following the rules of the breeding stages and pullorum control classes of the plan. These lists frequently come to the attention of prospective purchasers that are not reached by other types of advertising.

Many extension specialists have been bothered by the twilight zone where educational work leaves off and regulatory work begins. Letters of instruction have been issued by the Director of Extension and these have helped to outline the field of activities. The expansion of State poultry improvement associations and the organization of new associations in a number of States has come about partly as a result of the efforts and policy of the Extension Service. The poultry specialists have found such associations assist them in their poultry educational programs.

In certain States, such as Alabama, the administration of the plan is in the hands of the regulatory officials entirely and the representatives of the Extension Service serve in an advisory capacity. They can and do help the plan quite materially from the educational standpoint. In other States, such as Utah, the Extension Service employee serves on the Poultry Improvement Board and in so doing exerts considerable influence on the plan.

A few concrete examples will show you how the Extension Service has fostered the program and may suggest a feasible method that can be utilized in your own State. In North Carolina a part time specialist was appointed with the agreement that the days spent doing inspection work for the R.O.P. association would be paid for by that association. Georgia has adopted the national plan as a major project in poultry breeding in the extension program. This gives the specialist an excellent opportunity to train the flock-selecting agents and supervise the entire plan.

One State extension staff built a poultry improvement exhibit and displayed it at numerous county fairs, thus reaching a large number of people. The new motion picture on the plan has already been used by one poultry specialist and we hope will be used by many others.

In Kansas the poultry record book for the demonstration farm flocks was financed by the Poultry Improvement Association, but the record-keeping work is supervised by the Extension Division.

In Michigan the 6,000 members who belong to the Poultry Improvement Association are carried on the extension mailing list and subject matter information is supplied to them. Selected farms are used in making tours and conducting surveys.

Information on the quality of National Poultry Improvement Plan chicks as a result of the selection and blood testing program must be distributed not only to the chick-buying public but to the flock owners who furnish eggs to the hatchery. One very effective way to educate the flock owners is to invite them to meetings at the hatcheries. This is often done in cooperation with the local county agents and the State specialists who cooperate in holding poultry schools. The methods of housing and feeding to produce hatchability in eggs is a very popular subject at such meetings. When the schools are held early in the season a demonstration of blood testing is often given, thus the flock owners who are cooperating for the first year get an idea of the equipment necessary for making the test and the thoroughness with which the work is conducted. Pictures of such schools make excellent copy for news stories in local and nearby papers. Advertising the plan and educating the public to quality chicks can be accomplished by such meetings.

But I would not mislead you into thinking that all the poultry specialists are endorsing the plan. Seven States, as you know, are not represented here. The poultry specialist in a State that is not cooperating writes in his 1936 annual report: "There has been no demand for the National Poultry Improvement Plan." Another specialist reports that they have set up a State plan with identical standards except the source of supply of out-of-State eggs. Another State uses the national plan terminology in the pullorum control classes but makes no mention of the breed improvement work. In his State the initials "U. S." are omitted.

In one State the poultry specialist criticizes the plan for in his 1935 annual report he says:

> "In all sincerity the writer believes the National Poultry Improvement Plan is scientifically unsound, that it is administratively unenforcable, that it does not accurately define the grades designated and does not enable the prospective purchaser of breeding stock to evaluate breeding potentiality of any flock or any individual within such flock, and that it is an official bandwagon constructed by individual breeders on which they might ride at the expense of a gullible public."

Again in the 1936 report in discussing the National Poultry Improvement Plan he states:

> "If such plans could be written with the aim of establishing grades of stock leaving it to the individual breeder to do his own breeding and with a sincere desire to serve the buying public through the establishment of grades representing true values; their chances of success with the program, and the service rendered to the industry, would be greatly increased."

It has frequently been stated that the plan is entirely voluntary and the foregoing statements are quoted to show how that poultry specialist, a representative of the Extension Service, feels on the subject.

In our official family in Washington we can report the finest kind of cooperation. We have assisted in the preparation of the motion picture film which we plan to show you tonight and have a film strip on the National Poultry Improvement Plan in the process of preparation.

In summary the Extension Service assists the National Poultry Improvement Plan by promoting the use of high-quality eggs, baby chicks, and breeding stock, thereby bringing about increased efficiency and economical production. By teaching methods they develop the want for such products. The Extension Service assists in holding schools for training flock-selecting and pullorum-testing agents and, through serving on boards of directors of official State agencies, assists in supervising the work of such employees. It assists in collecting records of individual demonstration flocks and holds educational meetings with such cooperators. It assembles and distributes lists of cooperators and gives demonstrations on selecting of breeders and testing for pullorum disease. The Extension Service develops demonstration teams of 4-H Club members on subject-matter methods recommended by the plan. We hope that you people as representatives of the plan will continue to call on us to do our part in making poultry production more profitable, thereby making the American farm home a better place in which to live.

OUR EXPERIENCE IN OPERATING A U. S. CERTIFIED, PULLORUM-TESTED WHITE LEGHORN HATCHERY

By W. O. Ramshaw, hatchery operator, president, Utah Hatcher's and Breeder's Association, Salt Lake City, Utah.

I don't suppose any one ever gets over experiencing a certain feeling of satisfaction through being the possessor of the largest of anything, whether it be an apple in childhood days or something else later in life. Naturally we felt quite proud and flattered when Mr. Zumbro told us last fall when he was in Salt Lake City that, to the best of his knowledge, we were the largest hatchery in the country producing U. S. Certified Pullorum-Tested White Leghorn chicks. However, size sometimes seems to be a rather negative blessing.

In January and early February of this year, chick orders were almost as scarce as the proverbial hen's teeth, and we were almost certain that our plant was at least twice as large as might be necessary this year. The picture began to brighten up to some extent about the first of March, however, and since about the 20th of March we have had a normal full capacity run, throughout our combined baby-chick and turkey-poult business. The first of our incubators at our Provo plant was shut down last week. We have had no surplus chicks to amount to anything at any time this season.

We understand that in some sections of the country conditions have become progressively worse this year and that generally speaking hatcheries have not been able to operate at full capacity or if they did, have had considerable surplus chicks to dispose of, so we will have to give at least part of the credit to the National Poultry Improvement Plan and Certified chicks. I do not mean to imply that we will produce as many chicks as last year, because the usual January and February and early March business this season was far below normal. Everything considered, however, we felt quite fortunate in being able to use our entire hatching equipment for the length of time we have.

In our case it was not at all difficult to qualify for the production of Certified White Leghorn chicks as our standards were already as high as those established by the national plan on most points and higher on some.

As most of you know, when the national plan was first proposed in the fall of 1934, it was immediately adopted in Utah as a State-sponsored project for the 1935 hatching season and we qualified for the production of Certified Pullorum-Tested Leghorns that year. We had been operating under an improvement program sponsored by the Extension Service and the Hatchers' and Breeders' Association for some time past, but we welcomed this new national program because it immediately gave us more definite standards to work to, especially on some points which had been more or less controversial in the past, particularly definite terminology, and, we felt, it would rapidly find acceptance among the poultrymen. It also brought us into closer contact and cooperation with the Extension Service, the Poultry Department of the Agricultural College, and the State Board of Agriculture, with the result that we were benefited in many ways and, we think, those departments also obtained a better understanding of hatchery problems than they had had in the past. We feel exceedingly fortunate in having had men of the caliber of Mr. Frischknecht, Prof. Alder, Dr. Madsen, and Dr. Hendricks to work with, and a large part of the credit for the success of the program in Utah belongs to them.

We have qualified for the production of Certified chicks ever since, and annually mate up approximately 40,000 Leghorn hens for that purpose. Most of these hens are of our own hatching, and are mated to the R.O.P. males which we supply. So far as possible we use hens in their second laying year, although it is usually necessary to use some January and February hatched pullets in order to have a sufficient quantity of birds mated and we feel that such birds are preferable as breeders when they are from stock which we know and are acquainted with, than two year olds of inferior breeding. In some few instances later hatched pullets are mated. In most cases, however, such birds are pullets owned by our local R.O.P. breeders or out of their flocks so that in these cases also we know what is back of them.

For some years past we have purchased our breeding cockerels at from eight to twelve weeks of age. For the past two or three years, however, we have been buying only mature, qualified R.O.P. cockerels ready for the breeding pens. We believe that the latter arrangement has been the most satisfactory and least expensive to us.

When younger birds are purchased there is usually a rather heavy mortality through the growing period due to fighting, etc. and there is also a loss at maturity through those that fail to qualify at six months of age. We believe that the R.O.P. breeders in most cases are in a better position to carry the birds through to maturity than the hatchery and in this manner we also buy only birds we know we can use. So far we have had no difficulty in obtaining all of the qualified R.O.P. males we needed to mate with our flocks, with standards, both as to egg production and physical qualifications, particularly size, well above the minimum requirements of the plan.

We have had no objection to the program from our breeding flock owners. Some of these people have supplied us with eggs for more than fifteen years, many of them six or seven years. Probably one consideration has been that under our method of operation no additional burden was placed upon the flock owners. We have always made it a practice to absorb the cost of the flock-selecting and blood-testing work except for the helpers necessary at each flock when the work is being done. Our principal reason for this has been that the hatching seasons vary considerably in length and when the flock owner hasn't invested a lot of actual cash in such work he does not feel quite so badly dealt with if it should be necessary to discontinue taking his eggs after a comparatively short run. In this way we also avoid any temptation to hatch a lot of surplus chicks as we are not compelled to set eggs without having the orders in sight. For the same reason we give the flock owner his choice of either purchasing the pedigreed male birds from us or having us furnish them at our expense. In the latter case, however, he received 5 cents per dozen less for his eggs than the flock owner who purchases the male birds outright.

In a long season the flock owner who purchases the males is money ahead, but in a short season the other man who lets us furnish the males wins. The arrangement has proved very satisfactory, however, and while it naturally places a substantial additional burden on the hatchery to finance its operations in this manner, we feel that the increased satisfaction of the flock owners makes this well worth while.

The flock-selecting and pullorum-testing work is done by hatchery employees who have successfully completed the course of training, and passed the examination given each year at the State agricultural college, and who have then been issued their permits to do that work in the field under the supervision of the Extension Service and the State Board of Agriculture. With but one or two exceptions we have had the same men doing this work for us ever since the program was put into effect, and in fact in most cases, for several years before that. So far as possible we try to get all of this work completed in the fall while the weather is good, but after the extreme heat of the summer has passed, and also get the male birds placed in the breeding flocks as soon as possible after the birds are selected and blood tested. I might add that this flock-selecting and blood-testing work is done by crews which usually consist of one of our older men as the foreman who does the handling of the birds and selects the ones to be used for breeding, and two of the younger fellows to do the pullorum testing. In some instances we also send along one or two helpers, but in most cases the helpers, who put the sealed leg bands on the birds, are furnished by the flock owner.

The flocks are inspected at intervals afterwards through the hatching season by the flock supervisor, who works with the flock owners so as to obtain the best hatchability through proper feeding and care of the birds and care of the eggs, and also sees to it that the coops and premises are kept in the proper condition, etc. These inspections are in addition to those made by the official State inspector.

Since the hatching season of 1931, we have contracted for our hatching eggs on a hatchability basis. Under this arrangement we pay a premium over market of 10 cents per dozen, in those cases where the male birds heading the flock are furnished by the hatchery, and 15 cents per dozen over market in those cases where the flock owner owns the male birds, and an additional premium or bonus according to the percent of eggs hatched. Payments are made as follows: The eggs are graded by the flock owners before they are brought into the hatchery and then, when they are placed in the trays, are graded again of course, by the trayers, and any eggs they find which may be undersized, off colored, cracked, misshapen, or otherwise unsuitable, are rejected. These rejected eggs are then sold on the market. After the eggs are trayed and the grading slips sent into the office, the flock owner is advanced the prevailing market price for "extra" grade eggs, plus the starting premium mentioned above; that is, 10 or 15 cents per dozen as the case may be, together with whatever may be due him for the rejected eggs which were sold on the market. We make these payments to the flock owners once each week for all the eggs brought into the hatchery the preceding week up to and including Saturday night. This gives us time to get the eggs trayed, graded, counted, and the egg tickets figured in a regular routine manner. After the eggs hatch, the hatchability of each man's eggs is calculated and any bonus which may be due him according to the hatchability is added to his egg check for the week. We have regular forms, with spaces provided for all the necessary items and information, so that all the clerk who handles this work has to do is to fill in the proper amounts in the right places.

Naturally this requires some additional clerical work, as compared with purchasing eggs on a flat-rate basis. However, the first year we put this system into effect our average hatchability was increased approximately ten percent over the year before. We feel that it is worth the extra effort for several reasons. The flock owners are better satisfied, because they get paid in proportion to what their eggs are worth, which gives them an extra incentive to produce eggs that will hatch well.

To sum the matter up, as far as we are concerned it really isn't any more difficult to produce U. S. Certified pullorum-tested White Leghorns than it would be to produce any other kind of chicks, and we do feel that there are a number of very definite advantages, both to the hatcheries and to the buying public.

Among the advantages we might list are: First, increased prestige with the chick buyers, especially among the better class of poultrymen who appreciate quality rather than price; second, closer cooperation with the State College of Agriculture, State Board of Agriculture, and Extension Service in flock-improvement work, including the training of the hatchery employees to do the field work in the breeding flocks, working with the flock owners themselves, and in acquainting the poultrymen generally with the merits of the program and the products produced under it. Third, the poultrymen who buy the chicks are assured of getting a standardized product, which at least meets definite minimum requirements described by terminology with officially accepted meaning, and produced under such conditions and supervision that he can verify for himself the claims of the hatchery before he makes the purchase. It is our opinion that as the program is continued in force and improved and perfected each succeeding year, and as the chick buyers become more familiar with what it means to them to be able to purchase a more standardized product, with the assurance that they will get what they pay for, it will become increasingly difficult to sell chicks not produced under this program.

There are of course, some disadvantages from a hatchery standpoint. One is that there is some increased cost through the use of R.O.P. males, as compared with private record males, but in terms of cost per chick, this difference is very small indeed. Of course as compared with using males without any pedigree breeding back of them at all, it would be a noticeable increase, but personally I cannot conceive of any informed commercial poultryman buying chicks for egg production unless they were sired by males of known record ancestry.

At the present time in Utah, there is also some increased cost due to the fact that the hatcheries assess themselves to stand half the cost of the official State inspectors who supervise the field work. This is also rather small in cost per chick, but I believe that it will only be a question of time until the State Board of Agriculture will be in position to absorb all that expense. We feel that this should properly be borne by the State, as at the present time the proportion of the agricultural budget devoted to poultry work is not in proportion to its economic importance compared with other agricultural products.

Occasionally some flock owner will object to having a State inspector with whom he is not personally acquainted, and in whom he therefore lacks confidence, tell him how to handle his own flock of birds. This is only true in a few isolated cases, of course, but I merely mention it to show how important it is to have the right men as State inspectors or supervisors. They must be not only accomplished diplomats, but practical poultrymen, courteous and yet able to produce the desired results.

Another problem is that of educating the great mass of the poultrymen as to the meaning of the program and its various stages, and also to purchase quality rather than price. Considerable headway has been made in that direction during the last two years, but it is my opinion that more publicity in the national magazines, particularly those which reach the poultrymen, that is the consuming poultrymen, in the form of articles, etc., would probably help. I am of the opinion also that perhaps more time should be alloted to poultry work by the county agents than has been true in the past. I realize that they have been badly overworked in a good many cases during the last two or three years with a number of special programs pertaining to other forms of agriculture which they have had to take care of. At the same time, the economic importance of the poultry industry would seem to justify a little more emphasis by them, and a more intimate knowledge of the program, so that they would be in better position to help put it over among the farmers and poultrymen with whom they come in contact.

Before closing, I would like to make a few general suggestions. In the first place, I feel that these annual conferences to discuss problems which have developed during the past season, and to try to improve the program for the next season, are an excellent thing. However, I am wondering whether it might not be to the best interests of the industry to hold these conferences immediately following the International Baby Chick Association convention at the same location in order to give hatcherymen in general more of an opportunity to listen in on at least a part of the talks and discussions. I for one, am getting a great deal of valuable information at this conference, and believe that other hatcherymen would appreciate an opportunity to hear some of these distinguished gentlemen, even though they took no part in the discussions themselves. I would like to see a greater percentage of the hatcherymen of the country cooperating in the program and it might be that if more of them had an opportunity to listen in on the inside, so to speak, it might help to accomplish that result.

As I have already stated, I would like to see more publicity given to the program in the magazines which reach the poultrymen. Perhaps an attempt should be made to put on a national advertising campaign sponsored by the combined poultry improvement organizations of the States cooperating. Perhaps that wouldn't be practical at the present time. I merely suggest this for future thought.

I also feel that perhaps more information concerning the program, its aims and accomplishments, should be given to the Smith-Hughes and vocational agricultural instructors in the various high schools. I may be mistaken, but believe that with very few exceptions these men are not so well informed on this subject as they might be, and they are in position to exert considerable influence, not only upon the young people in their classes, but through them upon their parents.

I also believe that in all such publicity and information more emphasis should be placed on the fact that participation in the program is entirely voluntary, as some people, and probably quite a good many of them, from what we have observed, seem to be under the impression that this program is much the same as the hatchery code, with all hatcheries being compelled to operate under its provisions.

In conclusion, after three years of operating under the provisions of the program, the first of which was under State supervision alone, of course, we are still thoroughly sold on its merits, both for the buying public and the hatcheries. We know that there has been considerable criticism on the part of some interests whose principal objection seems to be that they don't want any Government men poking their noses into their business. As far as we are concerned we are proud of our plants, our facilities, and our product, and we invite visitors. We fail to see what difference it makes whether those visitors happen to be Government men or State men, or anyone else as long as we have nothing to hide and live up to the rules and regulations.

We are proud of the fact that we were among the first in the country to adopt this program, and expect to operate under its provisions for a good many years to come.

APPLICATION OF U. S. RECORD OF PERFORMANCE BREEDING

By E. B. Parmenter, poultry breeder, president, Massachusetts R.O.P.
Breeders Association, Inc., Franklin, Mass.

Perhaps the early history of my strain of pedigree Reds will be of interest along with the present method of breeding for high production.

It was in 1898 that my father, a general farmer with a dairy and some poultry, mostly Barred Rocks, purchased ten Rose Comb Rhode Island Red hens and a cockerel through an advertisement in a farm paper. These birds were purchased in Rhode Island, and were the first Rhode Island Reds in our immediate neighborhood in Massachusetts.

As these Reds laid better in winter than the Rocks, and did not die on the roosts, they were soon the only fowl raised on the farm.

After a few years occasional new blood was added through a male.

From 1911 - 1915 I covered most of the agricultural courses at the State college. Meanwhile, in 1913, the farm was sold and a more suitable poultry farm was purchased. In 1915 we started building poultry houses, and I commenced trap-nesting, which has never missed a day since that date, September 1, 1916.

As Single Comb Reds seemed to be more popular than the Rose, I developed our present strain from the Single Comb sports that we had at the time. It seemed that a larger percent of the singles laid well but the demand for Single Comb Red chicks was the deciding point.

In four years time I had developed a family that laid just barely 200 eggs on an average, and was practically 100 percent nonbroody. They were very light in color, however, and I could not increase their production over a period of three or four years.

Discovering that many broody birds made good records, I decided to combine these two factors in order possibly to obtain a combination of the two. The progress was necessarily slow, as my flock was rather slow maturing. Egg size and body size had been major points in the past, these both contributed toward a slow development toward a high-producing strain.

Beginning about eight years ago, I followed a more comprehensive program, which included selection first for early maturity, next for intensity, i.e., at least a clutch size of five, nonbroodiness, and lastly, persistency or the ability to lay at least a year before molting time. Since that time progress has been more uniform and permanent.

As soon as I got any number of high producers, over 250 eggs, I began progeny testing. I felt it was a waste of a year's breeding of our best hens to mate them to males just because their dams laid 250 eggs or better.

All males from superior hens were put in single male matings with pedigree pullets or stud mated with pullets in R.O.P. These males were used for a three-week period, the chicks being individually pedigreed. This makes it possible to check the difference between the females, also to make use of the progeny from superior parents. The use of pedigree pullets in single matings has some advantages in breeding. The inability of an R.O.P. breeder to make use of the males from such a mating nullifies this advantage, however. The advantage of pullet breeding is extra number of progeny obtainable a year in advance of hen breeding, and the good use to which the progeny of a few of these superior breeders can be put.

Progeny testing has entailed extra work, has had its part in the development of my strain, but has been modified by me at the present time because of two things. First, because all our 48 single male matings are taken by high-class one and two-year and older R.O.P. hens to furnish replacement stock for R.O.P. trapping, as well as to meet the demand for sale of hatching eggs and chicks. Second, I have found that the testing of large numbers of males is not so important now as formerly. As I have purified different factors, increased my R.O.P. pullet production average, the results are surer than formerly. I firmly believe the most important point in the development of any particular factor in a breeding program is the purification of that factor. Purification of a breeding factor is its continued presence in successive generations together with the absence of its complement.

Whether it be intensity or persistency, the only sure way of knowing that either factor is firmly incorporated in a flock, is that at least 75 percent of that flock produce at least three succeeding generations with a predominance of those points. I firmly believe that high intensity has been the greatest contributing factor toward high production in comparison with the Reds of other years. Persistency is next in importance with nonbroodiness a very valuable contributing factor.

Selection for high hatchability has been practiced at all times. It is more difficult to keep hatchability high after obtaining it than it might seem. Contributing breeding factors, such as large egg size and extreme persistency, tend to lower hatchability. This makes it more difficult to set the marke where economically we should emphasize one factor at the expense of the other.

The inheritance of egg size adds to this problem. I find that genetically we cannot be sure that the two-ounce egg will give large-egg progeny. A certain percentage of pullets that lay eggs weighing just two ounces never as hens lay eggs much larger, and after a short laying period may even drop below their pullet year average. This type of bird is more than likely to be a genetically small-egg hen. A slightly higher standard than 24 ounces to the dozen is necessary to exclude this type of bird; 26-ounce hen eggs will most likely exclude her; 25 ounce will not, neither will the pullet that lays only 24-ounce eggs.

There is another type of high producers that is an ever present source of exasperation and disappointment. I refer here to the super-persistent high producers, the type of pullet that lays 13 or more months continuously, is nearly impossible to throw into a molt and invariably is a poor hatcher or an absolute failure from a fertility or hatchability angle or both combined. The highest-producing contest birds are many times the worst offenders in this respect. I have not yet proved to myself if they are a genetic class or a case of preferential mating. It will be necessary to trace the progeny a few more generations to come to a definite conclusion.

The more immediate breeding problems are livability, egg quality, and chick quality.

The livability problem is very important, and the breeder can make the greatest contribution. I have voted whenever possible for larger entries at contests and for the counting of records of all hens entered. I feel the breeders need to have this problem thrust more forcibly upon them in order to get quicker and more unified results.

The new Standard Contest ruling will show up advantageously more good average flocks combining vitality plus production rather than high production with vitality secondary.

Egg quality and chick quality are always going to be our problems especially with high producers.

In choosing contest birds I have invariably tried to pick the pullets with good seeming vitality from the better-producing half of the pullets that were coming into production at contest time. This has resulted in a wide choice of families. In 1935-36 the pullets from my eight contest pens were from 13 males and 48 different females. I consider this a very fair sample of a pedigree breeder's flock. Of course selection is of some importance.

Pedigree breeding is becoming increasingly more complicated and laborious. R.O.P. rulings have been both a help and a hindrance. A pedigree breeder will never be able to succeed financially from sale of pedigree stock and eggs alone. More rules and regulations together with pedigree record keeping will keep many small pedigree breeders from taking the next step up in R.O.P. work.

With the general standard of production of all poultry considerably improved over that of a few years ago in the East, the demand for further improvement by pedigree breeders is not what it was. The demand is increasing in the West, but I question the permanency of this demand. Better quality from a disease-free angle or a production angle is easily and quickly obtainable nowadays in the poultry business.

One doesn't need all five of the genetic points to get 180-200 egg hens. Thus, the demand for a lowering of R.O.P. standards seems ridiculous to an older breeder. The older R.O.P. breeders of today have done many long years of experimental and improvement breeding. It is not logical that standards be lowered to allow an influx of inexperienced breeders or poultrymen with pecuniary desires to usurp the grade of the pedigree breeders who have been the source of supply of better stock in the past.

Every industry or branch is looking for the most up-to-date fashion of protection. The pedigree breeders are not asking for it, but they are demanding that the high standards they have established be maintained.

MARKET REQUIREMENTS FOR QUALITY POULTRY

By George F. Stewart, in charge of research in poultry and dairy products, Omaha Cold Storage Company, Omaha, Nebr.

As Dr. Jull intimated yesterday, our ignorance as to the problems facing us is colossal. In our efforts to supply the answers to those questions which are unanswerable for lack of information, we get in hot water.

Regardless of what some of us believe, we have got to think of market poultry as a co-product with, rather than as a by-product of, egg production. Fortunately, it is not a question of whether or not we have satisfactory breeds, but rather as to whether or not we are handling the selection of stock to the best advantage to maintain flocks representative of the breeds. Particularly is this true of the weight-conformation ratio.

In our mad scramble for egg-producing strains, we have birds of widely varying body shapes, which results in a large percentage of low-grade dressed poultry. The removal of this variation of body shape would go a long way toward a solution of our market poultry problem. It will be generally conceded by every thinking breeder that in the long run, a balanced production of quality eggs and of poultry meat will be more economical than either alone.

To state briefly; the desirable poultry carcass calls for the enumeration of the following quality factors:

1. Compact, plump and low-set bodies.
2. Heavy fleshing on the breast.
3. Straight or only slightly curved keel on both male and female.
4. Bones not too heavy.
5. Well-balanced bodies.

To say that the production of all these quality factors depends solely upon the breeder would be as mistaken as to say it is all up to feeding. None the less, the breeder is in the driver's seat, since he is the man who can start us on the right or the wrong road. Without the bird of good heritable qualities, there is no use trying to feed and care for a bird in the most up-to-date fashion and expect high quality when the bird is not capable of becoming a top-quality animal. Feed and care will not keep it from being long-legged, high-shouldered and sharp-breasted if it is genetically so constituted.

To consider our subject further, let us analyse the requirements for quality in its broadest sense. A consumer of poultry meat usually expresses a desire for a well-proportioned body, heavilyfleshed in breast, leg and thigh, well fattened throughout and carrying a minimum of bone. Very few of our present supply would measure up to these standards. Perhaps if a large percentage of them did, our average consumption of a meager 50 pounds of poultry meat per year would be considerably increased.

The problem of producing a high-quality broiler carcass is not a pressing one. The Leghorns and other breeds meet the demands successfully and the former most economically.

Inasmuch as our Leghorns are not suitable for efficient production for desirable quality in roasters, we must depend on the general-purpose stock such as: Orpingtons, Rocks, Hampshires, Reds, Wyandottes, and so forth.

The desirable economic characteristics, according to Dr. Maw, are as follows:

1. Physical vigor and health.
2. Breed type and size of body.
3. Breeding ability.
4. Normal growth.
5. Good fleshing during growth.
6. Early feathering.
7. Egg-production breeding.

The first item is of obviously paramount importance. Particularly is it important to owners of fattening stations where it is desired to fatten birds over extended periods of time. Recently it has become more and more difficult to find birds that will "stand up" under even moderately long periods of heavy feeding.

Breed type and size of body deserve your special attention, with emphasis for well-proportioned bodies. The grade of poultry reaching the consumer is largely determined by this factor.

No special comment is made on the next item. Normal growth is a desired quality. We should avoid individuals of early maturing types which run to undersized or underweighted birds. Equally important is the undesirability of slow growing, late-maturing stock that are, economically, poor business risks. The next item's importance is obvious. It is understood that feed and management play an extremely important part here. Early feathering is obviously important; it is a heritable characteristic and one which can be controlled through selection. Last, normal development of the healthy individual should be conducive to egg production, as well as to good body form and ability to finish into a first-class meat carcass. In general the production of an economic type (as to quality of meat and kind and number of eggs) through selection and care of the proper stock should be possible.

The general basis for grading dressed poultry is uniformity in size, shape, and finish of the stock. This uniformity of quality is obtainable by means of a thoughful, careful selection of breeding flocks, together with good management and feeding for finish in the young stock. Healthy, well-grown birds are able to withstand the heavy feeding that is required to give us high-grade carcasses. More poultry of this class on the markets is sure to increase poultry meat consumption and provide us with a firmer economic foundation for our industry. Our knowledge of poultry meat is indeed meager. For information on the subject, I have had to rely almost wholly on three sources: Dr. Maw of MacDonald College, Dr. Waters of Iowa State College, and the United States Department of Agriculture. We need more work on this problem. I appeal to you to spread the gospel.

In closing let me repeat -- market poultry is by and large a co-product with, rather than a by-product of, egg production. Let us realize the significance of this statement, and our industry will be benefited.

HOW THE NATIONAL POULTRY IMPROVEMENT PLAN CAN SERVE THE POULTRY INDUSTRY

By James E. Rice, president, Northeastern Poultry Producers Council,
Trumansburg, N. Y.

To undertake adequately to discuss the subject "How the National Poultry Improvement Plan can Serve the Poultry Industry" is a large order. Perhaps it would be well at the start merely to enumerate some of the more important objectives, in order to have them in the pciture and then to discuss some of these objectives briefly, as the time and occasion may permit.

These proposals are mentioned more in the order in which they occur rather than in any logical order of sequence or of their importance.

The Need

All large movements grow out of necessity and they expand with experience. They are measured by the intelligence, the enterprise, and the ideals of the people whom they affect. The National Poultry Improvement Plan is no exception to the rule. It is being built on the solid foundation of necessity. The need was to design a plan for establishing progressive stages for systematic breeding and disease control as essential first, to profitable production; second, to provide an accurate classification of grades and appropriate terminology in order to facilitate economical distribution; and third, to insure proper administration and enforcement through official State supervision and Federal Government coordination and administration. These three purposes have been largely attained in the first two years the plan has been in effect. At least a solid foundation has been laid and a strong superstructure is being built. Now we must proceed with the completion of the structure and learn to operate it successfully.

Ten Important Objectives

Among the major objectives of the plan may be mentioned: First, to make the four breeding stages and three pullorum-control classes of the plan uniform throughout the United States in fact as well as in theory. Uniformity is essential to the successful operation of any plan in which grades, terminology, methods of inspection, and enforcement are all involved.

Second: To raise the minimum requirements for all breeding stages and pullorum-control classes as rapidly as possible with the object in view of protecting the interests of those who already exceed the minimum requirements rather than to lower minimum requirements to permit those to qualify who are not prepared to participate. Our eyes should be focused upward not downward.

Third: To enforce to the full extent of the authority of the State and Federal Governments all of the rules and regulations as the only means of protecting those who observe the law against those who break the law. Without effective enforcement the plan will fail.

Fourth: To educate the breeders and hatcherymen and the public in general by every available means regarding the plan and the methods followed in order to insure the widest possible participation.

Fifth: To publish annual reports giving the exact details of how each State is carrying out its responsibilities under the plan. Publicity is the most effective weapon against abuse and the most efficient means of rewarding worthy accomplishments.

Sixth: The Federal Government to assist the poultry breeders in the U.S. R.O.M. stage to establish an "Advanced Registry" for the keeping of records and transfers similar to the plan followed by many livestock registry associations, but the Federal Government should not operate it.

Seventh: To promote by every legitimate means of publicity the distribution of superior breeding stock, eggs, and chicks to the end that the general level of quality of poultry may be raised throughout the United States and that those who assume the heavy expense of official supervision may be justly rewarded for their efforts.

Eighth: To encourage in every possible way the closest cooperation between those who represent the official State agencies and the Federal Government in the administration of the plan, with the breeders and hatcherymen. Conferences such as this one are good examples of good cooperation. The proportion of officials and producers attending should be about 50-50. Neither group should dominate the other.

Ninth: To encourage the most effective organization of the cooperating breeders and hatcherymen by recognizing them as essential co-partners in developing and promoting the plan. One of the most valuable results of the National Poultry Improvement Plan should be the development of leadership within the industry through acquaintance and the assumption of responsibility.

Tenth: To promote friendship: Mutual acquaintance inspires confidence and confidence builds friendship.

The best pulling magnet for attendance at annual conferences, such as this one, is to provide national authorities on breeding and selection as speakers. These should include all four groups about equally: (1) the doers, the breeders, (2) the discoverers, the investigators, (3) the tellers, the teachers and (4) the organizers, the administrators. Each will inspire and instruct the others.

The Federal group is to be heartily commended for the way in which this conference has been organized and is being conducted. Now, let us take a look at the plan.

Its Significance

The National Poultry Improvement Plan is a significant and impressive document. It marks a distinct epoch in the development of poultry husbandry. It probably has no parallel in the history of animal breeding in this or any other country. At first sight, this use of the superlative degree may appear to be unwarranted. No doubt, this would be true if measured by the accomplishments to date. But looking backward we may ask, where is a parallel for comparison to be found in the entire realm of animal breeding.

This high prophetic vision of the plan, however, should not be construed as implying attained perfection. The plan, now only 12 years since birth and only two years old in actual operation, has revealed many elements of both strength and weakness, but it is growing daily in scope and usefulness.

When, How and by Whom Started

The exact beginnings of the development of a National Poultry Improvement Plan are somewhat hazy. The nebulous stage apparently was from 1915 to 1925: The formative stage was from 1925, when the subject was officially discussed at the annual meeting of the Poultry Science Association at Manhattan, Kansas, to 1934.

The crystalizing stage was from 1934 to 1935, when at a national meeting of all branches of the industry at Cleveland, Ohio, a pretty general agreement was reached regarding controversial grades and terminology, and following this came the adoption of the Federal Fair Trade Practice rules for the baby-chick industry at Washington, D. C., resulting in final agreement as one of the major accomplishments of the breeder and hatchery code.

Chief honors for the original idea of undertaking to unify and coordinate the many widely varying State plans for poultry breeding and disease control goes to Dr. Morley A. Jull, at that time senior poultry husbandman, Bureau of Animal Industry, U. S. Department of Agriculture. He may have imported the germ of the record-of-performance idea "duty free" from Canada. He was the first person to propose and actually promote a nation poultry improvement plan in the United States. The late Alben E. Jones took up the challenge soon afterward. From then on it was anybody's and everybody's plan for a decade or more.

Many Advantages of the Plan

There are at least eight major beneficial results to be derived from official participation in the National Poultry Improvement Plan. These are:

1. More profit to be derived by poultry breeders because of the production of superior stock, hatching eggs, and chicks for sale or for reproduction purposes.

2. Greater profits to hatcheries because of better laying flocks, hatching-egg quality, and healthier chicks and poults for sale, hence greater consumer satisfaction and more repeat orders.

3. More efficient stock, hatching eggs, and chicks available to farm-flock owners for the production of commercial eggs and meat of superior quality

4. Greater economic gain due to the reduction of losses to owners because of less mortality in incubation, rearing, and adult management.

5. Better breeder and hatchery protection against unscrupulous competitors.

6. A more thorough commercial poultry and egg market inspection service assured because of improvement in quality due to officially standardized production.

7. Large consumer interests more effectively safeguarded, due to improvement in the quality of poultry and eggs because of more efficient breeding and healthier stock.

8. The plan insures to a high degree accuracy and honesty in record keeping and administration, even though handled by "semi-remote control".

A Proved Need for Official State Supervision and Federal Coordination

The plan establishes clearly defined standards for the production, grading, and sale of hatching eggs, chicks, and stock under definite official terminology, carrying with it the implied guarantee of true quality by the official prefix U. S. before all official grades of stock, hatching eggs, and chicks, thus facilitating their purchase and sale in both intrastate and interstate commerce.

Official standards and inspection services are becoming all but universal in the United States. This is neither novel nor new. The policy is the result of necessity. It is increasing rapidly in response to a public demand. Official standards and inspection service now apply to nearly all important products and services. The poultry industry should be no exception to the rule in sharing these benefits.

It may be of interest, in this connection to here quote from a paper written by the writer and read before the annual meeting of the Poultry Science Association in 1929.

"What is Official and Why?"

"With the expansion and intensification of industry comes the necessity for constant reorganization and readjustment. This is essential to efficient administration.

"The poultry industry is no exception. It is now going through a rapid evolution, it is feeling its growth pains. This is inevitable, natural, and desirable.

"There are ten progressive principles involved in the evolution of a food-producing industry. Each step is based upon the other in a logical sequence. All must be included if the industry is to make a sound permanent growth. These ten principles may be linked together forming a chain of facts in the growth of the industry from infancy to maturity.

"The poultry industry is now in the 15-year-old-boy stage. It is trying to find itself. It is succeeding.

"The ten essential economic steps are:

1. Research is the basis of education.

2. Education is the basis of efficiency.

3. Efficiency is the basis of prosperity.

4. Business prosperity is dependent upon organization.

5. Efficient organization depends upon standardization of methods.

6. Standardization of methods and grades are essential to improvement in quality.

7. Dependable quality is the prime essential of increased consumption of a commodity.

8. A satisfied customer is the ultimate goal of orderly marketing of stock, eggs, or chicks.

agriculture representing education or the State department of agriculture representing regulation. This is the plan under which most of the State R.O.P., the egg-laying contests, and the disease eradication and marketing projects are conducted. It is the last word in completeness of officiality. It is increasing rapidly.

"The poultry industry is one of the latest branches of agriculture to adopt official standardization and supervision. It is one of the types of industry that would profit most by it.

For us to argue that official standardization and supervision of stock, eggs, and chicks are unnecessary is to fail to recognize and profit by the history of other branches of industry and of the trades and professions. Sometimes these have had the vision to see in advance the need to appreciate the benefit of supervision, but frequently the public has forced the issue in order to correct existing abuses. This was conspicuously true of banking and insurance.

"Official Supervision is not Confiscation or Arbitrary

"In all cooperation between State and Federal governments on the one side and the producers and consumers on the other hand, the two former, the officials, should be responsive to the latter, the people involved. What the public wants and demands, if it is right, it usually gets in this republic of ours. The poultry industry and the buying public are now demanding, as never before, proper official guarantees of quality.

"Procedure

"(1) The poultrymen should work through a legally incorporated poultryman's or hatcherymen's State organization as point of contact with the official State agencies. This is to avoid the commercial participation or legal complication of State institutions. It simplifies the whole cooperative procedure. The breeders' and hatchers' organizations should be the custodians of their own rules and regulations, including membership.

"On all of these business organization administrative matters the State and Federal governments should have no part. The official State agencies should have but one function: namely, to provide the necessary official, impartial, efficient inspection. These agencies should turn over to proper governmental legal departments all violations of State and national law, and leave the organizations to deal with their own problems of violation of their rules. They and they only should have and exercise the power of acceptance and expulsion of members. This is in conformity with world-wide centuries-old policy of all fraternal, trade, social, and other types of organization. The aggrieved member always has recourse to the usual courts of law for redress.

"The Goal of Official Attainment

"The goal toward which our eyes should be set constantly in all educational and regulatory work is that exact justice be done to producer and consumer. In order to attain that objective our methods must be so sound that they will command the confidence and respect of the leaders of the industry. With this we succeed; without it we fail.

"It is significant that almost without exception those who are cooperating in official State poultry-improvement and disease-control programs are among the most progressive and successful poultry producers and hatcherymen. The well-nigh universal attitude of good will and hearty support of college work by the industry at large is the most encouraging and convincing evidence that the colleges and agricultural departments in spite of many handicaps in working out policies and programs have been slowly but constantly winning the confidence and support of the people. If we continue to merit the confidence of the most progressive leaders of the industry, the others will follow. We move upward and onward, not downward and backward."

The above was written eight years ago, six years before the National Poultry Improvement Plan was in effect. It is quoted exactly as written except in a few instances to clarify the thought but not to change the meaning. In the light of what we have learned in the meantime I would not wish to correct or to modify any part of it.

Official Supervision and Coordination is not State or Federal Government Domination

An equal partnership exists between poultry breeders and hatcherymen and the State and Federal authorities.

The procedure followed in this partnership provides for mutual participation of the cooperating breeders and hatcherymen and the official State and Federal agencies. This partnership provides for:

First: A careful survey of the conditions in the breeding and hatching industry throughout the United States to explore and appraise the need.

Second: Frequent conference and consultation between all segments of the poultry breeding and hatching industry involved and the officials charged with the responsibility of supervising, coordinating, and administering the plan.

Third: Submission and resubmission of the plan for suggestion, correction, and amplification as experience has justified, with all States under the plan invited to participate in open forum.

Fourth: Progress reports prepared and submitted annually by the Federal Government as the coordinating authority with the official, supervising State agencies.

Fifth: Voluntary cooperation in the plan. All who elect to meet the requirements share in the benefits.

Sixth: Official State supervision with Federal coordination and general administration of the plan.

Seventh: Essentially self sustaining. The plan is financed entirely in some States and practically so in others by the breeders and hatcherymen who participate. The Federal Government carries out its general administrative responsibility to the industry by the expenditure of a comparatively small appropriation of $40,000 per year. This is a necessary and worthwhile investment in the interest of all taxpayers, since the benefits to be derived apply directly or indirectly to all who produce, handle, serve, or consume poultry and eggs.

If this be State or Federal domination or regimentation let us have more of it.

The Real Test of the Plan is, How it works out in Actual Practice.

The essential question to be asked and answered regarding the present status of the National Poultry Improvement Plan is, has the plan in a brief two-year formative period succeeded in accomplishing, to a substantial degree, four worthwhile accomplishments?

First: Has it resulted in improving the quality of poultry and eggs of the nation through better breeding?

Second: Has it tended to reduce the mortality and improve the livability of poultry?

Third: Has it helped to educate purchasers of purebred stock, hatching eggs and chicks to the fact that superior quality is the best guarantee of efficient poultry and egg production and profit?

Fourth: Has it made significant gains in State and individual memberships and popular support?

The best indication of the worth of the plan is that by almost unanimous consent the answer to each of these four questions is emphatically in the affirmative.

Is It Paternalism?

Objection has been voiced by some persons to the public recognition which the official State agencies and the Federal Government give to those who cooperate in the plan. Heretofore, this has been considered legitimate Government cooperation in the case of other kinds of livestock and products in many States and nations. The best remedy for this so-called discrimination, if any remedy is needed, would appear to be for the unofficial group to become official by joining in the plan and thus sharing in all of the benefits of official supervision. No one, of course, is barred from participation who meets the requirements. It should be understood, of course, that those breeders and hatcherymen who cooperate in the plan pay the cost for supervision and receive the benefits. Indirectly, at least, the nonparticipating group may share in the ultimate benefits through the possibility of purchasing stock, eggs, and chicks from those who are in the official group. Thus all might be benefited by the plan.

The official breeders and hatcherymen constitute a highly creditable, progressive group. They are not a closed corporation. All who wish to comply with the National Poultry Improvement Plan may share in the benefits. Membership is increasing. That fact alone is a good indication of the value of the plan.

State Initiative must Precede National Action.

The National Poultry Improvement Plan is a unification of State breeding and pullorum-control programs. This is as it should be. Cooperation in the National Poultry Improvement Plan being purely optional on the part of any individual or State, it is not surprising that several States should prefer to "go it alone". Hence the question of which policy should be followed, either individual State or the national plan, will depend upon the answer to the legitimate question, "Which offers the best all round inducements?"

On this question the determining factors to be considered are; (1) the comparative costs to the members; and (2) the desire to set up and maintain either higher standards or lower standards than those now in the National Poultry Improvement Plan.

These two fundamental questions offer a sound challenge to the national plan. The challenge must be met. Such competition between individual States and the national plan is wholesome and stimulating, even though confusing to the public. It is the American way of doing things.

This being a free country and most of us rugged individualists, it is not surprising that many small and some large breeders and hatcherymen prefer to depend upon their own knowledge and skill in culling, trap-nesting, breeder selection, mating and progeny testing, and, theoretically at least, to avoid the large official supervising expense. This is true particularly when the breeder or hatcheryman already has built up an enviable reputation for skillful breeding flock management and fair dealing, especially where the sales are mostly local and customers have first-hand information regarding the owner, the stock, and his methods.

The inability of all States to agree to cooperate under the National Poultry Improvement Plan, or for the individual breeders and hatcheries in any State to fail to cooperate with their official State agencies, though regrettable, should not be cause for serious worry. Such independence under certain circumstances may be beneficial to all concerned. At least it provides a valuable trial zone for testing out several State plans. However, it may be safe to predict that eventually all State official agencies will arrive at a common agreement and unite their efforts in support of a National Poultry Improvement Plan which will best meet the requirements.

A Possible Weakness in the Plan.

In the pursuit of the high ideal of national uniformity as distinct from State or regional uniformity, we may have undertaken to cover too much territory too quickly. We must recognize the fact that there is a disparity between the best and the worst in breeding and disease control in both privately managed and officially supervised breeding flocks within States and between States. While perfection has not been attained anywhere and still is remote, we all know that far greater advancement has been made by some breeders and hatcherymen than by others operating under the same classification. Any attempt to bring about perfect uniformity between divergent elements involves three possibilities: First: The establishment of high standards as an ideal to represent the greatest advancement in breeding and pullorum control. Second: To agree upon minimum requirements in order to accommodate the largest possible number under a National Poultry Improvement Plan so that they may enjoy the luxury of protection by the State and national Governments. Third: To strike an average between the two extremes of quality.

The manifest difficulty involved in establishing grades to meet the needs of all who wished to qualify was partly solved by providing four options in breeding stages and three classes in pullorum control. This provision was laboriously and progressively arrived at after 12 years or more of trying to agree upon a National Poultry Improvement Plan by the use of the five A's - Argument, Agitation, Acrimony, Adaptation and Arbitration. The result is a happy solution to the difficult problem of popularization of the plan to the needs of all. The key to the solution of the problem was the provision of 4 breeding stages and 3 pullorum-control classes. But still these may not yet be fully adequate to meet the widespread inequality. To overcome the possible differences still existing within each of four breeding stages and also within three pullorum-control classes is perhaps our most delicate problem. It would seem possible, however, by gradually raising the general level of requirements in the plan, to keep pace eventually with the rapid advance of our breeding programs and quality of poultry. The great flexibility of the plan in providing four progressive stages in breeding quality and three progressive pullorum-control classes should meet the special needs of all who are qualified to participate. Nevertheless the wide range of qualities now provided in the plan permits for cooperating breeders to make progressive advancement from the simplest stage, "U. S. Approved", to the "U. S. Certified", to the "U. S. Record of Performance", and to the "U. S. Register of Merit" stages respectively. This should make it possible for all who know and appreciate real quality, and are willing to pay the cost, eventually to participate in the improvement plan. All others should be required to wait until they can meet the requirements. The same conclusion should be true regarding the progressive pullorum-control classes, U. S. Pullorum-Tested, U. S. Pullorum-Passed and U. S. Pullorum-Clean, respectively, thus permitting gradual advances in freedom from pullorum disease.

We must remember that the National Poultry Improvement Plan was not designed to include all qualities of poultry, but only the individual birds which possessed sufficient merit as breeders to raise the average quality of the commercial and breeding flocks. Manifestly if the quality requirements of each of the four breeding stages and three pullorum-control classes are rigidly enforced a large proportion of the fowls of the country would not qualify, hence would be retained as unmated commercial layers or for common farm flock matings. This would reduce proportionately the number of birds used as U. S. Certified or U. S. Approved breeders.

Quality and quantity are two opposing factors. When quality goes up the quantity usually goes down or when the quantity goes up the quality is likely to go down on any given breeding farm or hatchery.

Do the Present Breeding Stages Fully Express True Value?

Perhaps the most difficult single problem in setting up and administering the plan is deciding upon standards of measurement of quality within the U.S. R.O.P. and U.S. R.O.M. breeding stages. This is a fundamental problem which must be solved if the breeding plan is to command the respect and support of the most progressive breeders. If the plan fails to receive the approval of the more advanced breeders in the U.S. R.O.M. or U.S. R.O.P. stages the loss will be reflected all the way down the line through the lower stages.

Let us take for example an inventory of a few of the many functions and factors which a breeder should consider in his breeding program. All of these are not included in the requirements for the U.S. R.O.P. or U.S. R.O.M. breeding stages. Let us see how many essential breeding factors are omitted in our third and fourth stage requirements and how many others should be included if they are to reflect to the public the many characters which the breeder himself must know if he is to mate skillfully or buy and sell intelligently. Some of these factors are:

1. Standard plumage color, body characteristics, and freedom from disqualifications and other defects.

2. Body weight variations with wide maximum and minimum individual limits.

3. Egg quality variations in size, shape, color, interior quality, and shell texture.

4. Egg production: annual, seasonal, winter pause, precocity, persistency, intensity, and total life production.

5. Degree of broodiness.

6. Comparative longevity and vigor and disease resistance.

7. Exact percentages of fertility and hatchability.

8. Progeny performance as indicated by (1) the number of chicks in the family and (2) the quality of offspring as measured by all the factors mentioned above when applied to both the sire and dam in a given mating.

9. The pedigrees of the ancestors with respect to all these factors for at least three generations.

It must be apparent to all that there is a widespread disparity between the long list of breeding characters which the R.O.M. and R.O.P. breeder must use in making his matings and those which are required and reported by the national plan. These widespread differences between the officially required report of characters and the characters which should be known and used by efficient breeders constitute a grave weakness in the national plan. The only way to overcome this defect is gradually to widen the official breeding base in the national plan. The wider the breeding base and the larger the number of characters included in the U.S. R.O.M. and U.S. R.O.P. requirements, the smaller will be the number of birds which will qualify and the smaller will be the number of poultry breeders who will be able to participate. Hence, we must follow the policy of agreeing upon a happy mean by including each year more and more characters as the number of breeders who can qualify increases.

To undertake to go the whole limit at once by including all the characters enumerated above, would make the U.S. R.O.M. and U.S. R.O.P. stages so prohibitive as to exclude all but a very few of the more advanced progeny testing breeders in the United States.

Perhaps this brief enumeration may be sufficient to indicate the fact that real poultry breeders, like poets, are "born and not made" and also that true "breeding quality" may be a more important economic factor even than the "egg-feed ratio".

It is equally important also to understand that the cost of producing highly prepotent, fecund males and females through many years of painstaking effort is out of all proportion to the usual sales price. We must educate the public to appreciate the wide difference between the well bred and "just ordinary run" of chicks.

One of the largest gains arising from participating in the National Poultry Improvement Plan is the increased income earning value to those who buy stock, hatching eggs, chicks, and pullets. Hence there is a distinct need for gradually developing a broader breeding base in our U.S. R.O.M. and U.S. R.O.P. breeding programs in order to produce better-balanced breeders for use in all four of our official breeding stages.

How High is Minimum?

The question of minimum requirements is primarily a question of degree. "Minimum" will depend upon the quality of birds required to represent the minimum in any particular State plan. To establish a minimum grade low enough to meet the low standards of any particular State in order that it may come under the plan, would work a gross injustice upon breeders, and hatcherymen in other States where the minimum requirements are higher and perhaps for many years have been higher for the same breeding stage.

Any individual breeder, hatcher, or State plan, it is true, may set a much higher standard than the U.S. minimum for any stage. But it is also equally true that a lower minimum requirement in any particular State should not provide an excuse for making similar low minimum standards in the National Poultry Improvement Plan. The ultimate responsibility for educating the buying public regarding the higher minimum standard of any individual or State, would rest primarily upon the individual breeder or hatcheryman, to prove his own superior minimum quality. This would be expensive and unfair. Moreover it is difficult to convince "John Q. Public" that a U.S. stage does not represent the highest quality in any official stage. It should do so. This alone is a valid reason for making U.S. signify a very high minimum quality.

What is Uniform?

A fundamental consideration in attempting to secure and to maintain national uniformity of State and Federal standards is the real danger which lies in the interpretation of the meaning of the word. Certainly any individual or State or group of States must maintain its high established standards It would be no kindness to any individual or State or group of States to lower reasonably high-grade requirements in the national plan to fit their own wishes. However, we should be able to find a satisfactory solution to the problem of lack of uniformity by which we may maintain sufficiently high standards under the U.S. official grades to attract and hold the membership of our most progressive advanced breeders and hatchers. If this should not prove to be true, then the National Poultry Improvement Plan must, for a time at least, go the way of some other national grades that trail the higher official State grades and terminology. While this independent procedure might be necessary as a last resort, it nevertheless would be unfortunate if it should occur. The State or group of States maintaining the higher standards eventually, we may predict, would win in a democracy where States rights are preserved and higher grades are maintained.

If the national standards are not sufficiently high to meet the requirements of those individuals or States who maintain the highest consistent ideals then the next step in the evolution of official grade standards would be to unify the State standards within regions and eventually unite these nationally with the other States whenever they have advanced sufficiently in their breeding and disease-control methods to justify it. Fortunately, this does not now appear to be necessary.

There is one bright ray of hope which may be expected to shine brighter each year. The longer the National Poultry Improvement Plan is in force, the better it becomes adjusted to meet the needs of all the States. The steady advancement of knowledge of the importance of superior quality breeding stock and thoroughness in pullorum control, the more our differences will disappear and the more the disagreements will be between individuals within States rather than between States or regions. National standardization is a process of gradual evolution from a lower level to a higher one. Quality-consciousness must be individual before it becomes State, regional or national. In the National Poultry Improvement Plan we are attempting to bridge all of these individual, State, and regional gaps at once. As might be anticipated we must expect some growth pains, but they can be endured and cured.

Danger in Mass Production

There is always a struggle in breeding between quantity production and quality production. Hence the quantity and quality must be kept in proper balance. The methods of inspection as well as the grade requirements, the breeding programs and pullorum testing determine the quality and quantity of stock, eggs and chicks. Each of these factors must be maintained on the same basis of authoritativeness if the products are to be comparable in quantity and thus in principle mean the same in all States. If they do not meet this test then the plan cannot justly be considered uniform and if not uniform it is unfair.

To Whom Much is Given Much is Required

One of the important privileges of membership in the National Poultry Improvement Plan is that it enables cooperators to use the prefix "U.S." as a mark of distinction. Hence, the quality should match the honor. This prefix "U.S." together with the official State seal, leg and wing bands, are distinct assets to each cooperator. It should be self-evident, therefore, that in order to secure full advantage for the distinction of having birds banded according to their official classification, all stock in each breeding stage and each pullorum-control class, should be individually handled and officially banded in fairness to the other cooperators in the same or other State. Methods must be equally authentic under the "U.S." guarantee.

"Uncle Sam's" Approval is an Important Asset

When deciding to cooperate in the National Poultry Improvement Plan (or to "go it alone" as an individual or a State) there is one important consideration which the individual or State should not overlook: It is that only breeders and hatcherymen who are officially cooperating with an official State agency, which in turn is cooperating with the Federal Government in the poultry improvement plan, are permitted to use the prefix "U.S." in each of the four breeding stages and three pullorum-control classes. In other words the "go it alone" breeders and hatcherymen and States, must shine alone in their own light and not by the reflected light of the U.S. official approval.

A Strong Organization of U.S. R.O.P. Breeders is Essential

The U.S. R.O.P. breeders should be thoroughly organized in order to agree upon the rules which best meet their needs. Their leaders should be the authoritative point of contact, the intermediary at all times between the U.S. R.O.P. breeders and the Federal Government, thus serving as a melting pot of ideas. This is on the general assumption that the Federal authorities would not be likely to disregard the wishes of the organized U.S. R.O.P. breeders. The United States Record of Performance Federation should be maintained as the authoritative voice for the U.S. R.O.P. breeders who believe that their affiliation with the organization will prove the most effective means of maintaining the highest possible consistent grades, the best methods of management and most efficient law enforcement. What is everybody's business is nobody's business. Maintaining membership in the United States Record of Performance Federation is a small price to pay for the large benefits to be derived.

Education - Our Chief Line of Defense and Advance.

Those in charge of the administration of the National Poultry Improvement Plan are to be highly commended for setting up this highly educational program for the second annual conference. It is attractive alike to the cooperating poultry breeders and hatcherymen, as it is to theofficial State authorities. This policy serves the purpose of emphasizing the quadruple nature of the joint partnership and the mutual responsibilities of (1) Breeders and hatcherymen cooperating in the plan, (2) the official State agencies, (3) the Federal Department of Agriculture, and (4) the Federal Trade Commission. It is clear that no one or two or any three of these groups alone would be able to function fully in the plan. All four must click accurately. The National Poultry Improvement Plan offers a supreme opportunity for developing leadership, promoting acquaintance, confidence, and common understanding. These are of greater importance than poultry breeding and disease control. The policy of holding each year similar national "get-together" conferences should be continued. The more the poultry breeders and hatcherymen assume control and the less the State and Federal governments are called upon to exercise authority, the more successful will be the National Poultry Improvement Plan.

Enforcement is Essential

If the National Poultry Improvement Plan is to place a proper premium on superior quality under the United States guarantee of quality, the symbol "U.S." must be fully protected. Hence, enforcement is a keyword which should be prominently written in action throughout the plan. Enforcement of all rules is the only assurance of fairness. The one who observes the rigid requirements pays a high charge for the service and has earned the right of protection. A participant in the plan who violates the rules is a more serious competitor than is a non-participant in the plan, since he enjoys the privilege of using the prefix "U.S." to deceive the public.

It is self-evident, therefore, that official methods of inspection, testing and record keeping in each State must be fully enforced to the "letter of the law", otherwise the high objectives of the National Poultry Improvement Plan will be defeated.

If there is a shadow of suspicion that either the State officials or the Federal authorities lack courage to report and punish dishonest practices or their methods of record keeping are inadequate to provide legal protection in case of violation, then the whole official plan must fail. Just how far the Federal authorities are able to go in enforcing the National Poultry Improvement Plan within and between the States, remains to be seen. Here the highly controversial question of States rights versus Federal control is involved. Where State and Federal authority begins and ends apparently has not been fully worked out. However, ways and means must be found for rigid enforcement.

Two Strong Arms

All members of the poultry industry should know and appreciate the fact that under the National Poultry Improvement Plan the cooperating poultry breeders and hatcherymen enjoy the combined authoritative protective agencies of the U. S. Department of Agriculture and the Federal Trade Commission. The former administers the plan and the latter investigates infringements of the fair trade practice provisions governing the baby-chick industry. Thus all who cooperate in the National Poultry Improvement Plan enjoy not only the advantage of producing and selling standard products bearing the prefix "U.S." which others are not permitted to use, but they have the protection of the State and Federal Government authority against those who violate the rules applying to official grades and terms.

In short the National Poultry Improvement Plan if it is properly administered and if the Federal Trade Commission carries out the responsibilities with which it is charged, will bring the poultry breeding and hatchery industry out of a state of utter confusion and unethical practices which have placed the honest breeders and hatcherymen at a decided disadvantage.

We should congratulate ourselves, the States and the U. S. Government that we are permitted to participate in a movement which holds such great possibilities for the welfare of the poultry industry and the nation.

OBJECTIVES OF THE NATIONAL POULTRY IMPROVEMENT PLAN

By Berley Winton, senior poultry husbandman, Bureau of Animal Industry, U. S. Department of Agriculture.

A brief review of developments as they have affected the poultry industry over a period of years is in keeping with an adequate understanding of the conditions that gave rise during the past two decades to organized poultry improvement work throughout the United States.

It will be recalled that during the last half of the 19th century and the first few years of the 20th century poultry exhibitions were in great prominence. At these shows emphasis was placed primarily on such characteristics as type, disqualifications, and feather pattern, rather than on utility values. Poultry exhibitions were primarily responsible for creating interest and maintaining enthusiasm in the development of new varieties and standardbred poultry.

With the development of better marketing methods due to an improved transportation system, the perfection and more extensive use of cold storage and refrigeration facilities, and a wider knowledge of comparative food values, eggs became more important as a food product in the diet of the people of this country. This change in the dietary habits was responsible for more attention being given to the production of a larger number of eggs. Thus the objectives of many breeders and farmer-producers were changed from that of producing chickens for supplying meat and eggs for home consumption and for their aesthetic qualities to that of breeding and raising chickens for their commercial meat and egg qualities.

Following this change of objectives, the poultry public was exposed to a deluge of promotional information on the merits of using for breeders birds with a "pedigree". The idea was generally accepted on the part of most people that as a result of using pedigreed breeding stock unexcelled benefits would be obtained. A sense of pride accompanied the purchase and use of pedigreed birds. Too often disappointment has been the result, but definite progress has been made in breeding operations, especially in recent years.

The invention of a forced-draft incubator in 1918 and the admittance of day-old chicks to the mails on March 15 of that year are more recent developments that have had a far-reaching influence on the poultry industry. These two developments contributed largely to our present-day baby-chick industry that consists of more than 12,000 hatcheries with an estimated capacity of close to 350 million eggs which are supplied by approximately 200,000 flock owners.

In the early development of the commercial hatchery industry and during the period when so much emphasis was being placed on the value of using pedigreed birds, hatcherymen and professional breeders followed, in the main, an independent course of action in improving their breeding flocks and in using terminology to describe their products. This procedure gave rise to ruthless competition and unethical advertising. The leaders of the industry were convinced that its welfare and continued progress required that these evils be corrected as speedily as possible. This conclusion and interest resulted in the formation of State poultry improvement associations. Because of the practical difficulties involved there was very little, if any, attempt among State organizations to coordinate their improvement activities. Consequently, considerable diversity of standards and variations in procedure were followed in doing breeding and pullorum testing work. The development of State associations did not lessen the confusion that previously existed among prospective purchasers. It merely indicated the value of organized cooperative effort and emphasized the need for a single coordinated program throughout the United States.

Scientific principles are not altered by State lines. This fact was recognized by poultry leaders, breeders, and hatcherymen in realizing the need for a more comprehensive and uniform program when the idea of a National Poultry Improvement Plan was proposed in 1925. From the time the idea of a national plan was proposed until it was finally formulated in 1934, many regional and national conferences were held for the purpose of outlining the principles to be included in the nation-wide program. It will be recalled that differences of opinion prevailed at many of the conferences. Too often heated discussions followed and these frequently precipitated antagonisms, especially among individuals from different sections of the country. At the present time we look back upon such experiences with considerable chagrin because we know now that it is possible to have a national program that is applicable to every section of the country and is within the realm of practicability for all those who desire to participate in a constructive breeding and pullorum-disease-control program.

From now on it is not too much for us to anticipate that the scientific aspect of every phase of the program will take precedence over preconceived ideas and sectionalism. In the future we feel certain that it will be possible to consider and develop the objectives and the administrative features of the National Poultry Improvement Plan in the light of the most recent scientific investigations. We should take cognizance of constructive criticisms and revise the plan in conformity with the facts. Also, we hope that intolerant and unreasonable objections to methods and practices whose values are proved by scientific evidence and practical use will soon vanish in a wholesome and cooperative attitude. Then the plan can render the greatest possible service to the poultry industry. This last year I heard a responsible public official make a statement at a meeting to the effect that very little, if any, good could be brought about by the use of the whole-blood stained-antigen method of testing for pullorum disease. Experience indicates definitely that this statement was not and is not in keeping with the facts. Statements that are equally at variance with established facts have been made concerning the breeding stages of the national plan.

With the advent of any new development that is destined to revolutionize an industry, as did the hatchery business, exploitation on the part of selfish interests usually occurs and the hatchery business was no exception to this rule. Fortunately for prospective purchasers of hatchery products poultry leaders, including many hatcherymen and breeders, visualized this possibility and took steps to counteract, so far as it was possipostal regulations and Federal Trade Commission rules governing to some extent the advertising and the sale of chicks. But in spite of all that was done there was a great deal of misrepresentation and a considerable amount of fraud practiced on the part of unscrupulous hatcherymen and breeders.

Progress in Poultry Breeding

For the country as a whole, progress in poultry breeding until recently consisted primarily in developing new varieties and popularizing the standard breeds and varieties rather than improving the commercial and economic qualities of these breeds and varieties. But during the last few years farmer-producers have concerned themselves with obtaining strains of chickens which have superior qualities as economical egg and meat producers.

At the present time, it appears that poultry breeders are emerging from the unwarranted practice of placing so much dependence on pedigrees. This is illustrated by the fact that many prospective purchasers demand to know not only the number of eggs produced and the number of eggs the dam and the sire's dam laid, but also the number of sisters in the family, their yearly egg production, hatchability records, their egg size, their body weight, and similar valuable information concerning their progeny.

There is nothing basically wrong with pedigrees. In fact, they are one of the indispensable tools of breeders. But their limitations have not been recognized. Too often the information contained in pedigrees is inadequate from a scientific standpoint. "The most valuable pedigree is the one that gives the full performance record -- bad points as well as good points."

Egg production, fertility, hatchability and viability are characters that are affected by both the inheritance and the environment of chickens. Geneticists say "that these characters are almost certainly the result of many genetic factors closely interacting, and this makes the problem of analysis extremely complex even when the factors are known, which is rarely, if ever, the case. This emphasizes the need of casting off all useless procedures and false standards that might make it harder to reach the goal of superiority in our poultry breeding operations.

Geneticists also say "everything that is known about genetics indicates that it is vital to concentrate on as small a number of objectives as possible. The important objectives in poultry breeding, as with other classes of livestock, are production, reproduction, and viability in the broadest sense. They are sufficiently difficult to attain without adding others that have no bearing on fundamental values. Every unnecessary factor introduced makes the problem that much harder.

Poultry improvement is of concern to more people than that of any other class of livestock. On the one hand we have producers who may be classified as professional breeders, farmer-producers, and hatcherymen. On the other hand we have the purchasers of breeding stock, hatching eggs and chicks, and the consumers of market products. The bridge between these important groups is spanned by scientists whose function it is to serve most effectively the interests of both groups. Scientists may do their part by developing facts and processes that will enable farmers to produce economically high-quality poultry food products.

The lack of more specific information on how genetic characters are transmitted or how they behave makes it exceedinly difficult to chart a course of procedure in breeding technique that will be entirely successful. The failure to develop dependable yardsticks for measuring the superiority or breeding worth of a strain of chickens has no doubt been hindered by the practice of including so many characters in the breeding program and by breeding from individuals rather than families. The complexity of the problem may be realized when we know that certain poultry breeders are endeavoring to develop strains of chickens which are free of standard disqualifications, superior in such characters as color, type, body size, skin color, egg weight, egg quality, lack of broodiness, hatchability, number of eggs, and resistance to disease.

The most satisfactory criterion for judging the breeding worth of our chickens is undoubtedly the progeny test. To facilitate the practical application of this procedure the Register of Merit breeding stage has been provided for in the national plan. In reality, this breeding stage may be regarded as the top rung of the R.O.P. ladder. The progeny test has its handicaps but it is the means which the most successful breeders have used to identify their superior individuals and families.

In this connection we believe that consideration should be given during this conference to the establishment of a Poultry Register of Merit Book, as an official activity of the National Poultry Improvement Plan. In such a book a complete record of every Register of Merit bird would be published under official supervision. It seems to me that the Record Form Committee which was appointed last year might be assigned to the task of formulating a Poultry Register of Merit Book.

Objectives of the National Plan

One of the long-time objectives of the National Poultry Improvement Plan and possibly the one that will be most far reaching in its effect is to serve as an agency through which scientific research may be made immediately applicable to the improvement of poultry and poultry products. This objective will be attained, first, by having scientists and professional breeders bring to us such facts as they are able to glean from their studies and experiences; second, by incorporating these principles into the national plan to the end that we may always be working on a constructive breeding and pullorum-disease-control program in our respective States. If this is done it is quite obvious that our program will need to be changed from time to time as new knowledge on breeding and pullorum-disease control is discovered by scientists and breeders. The possibility of an occasional, fundamental change should not deter anyone of us if it is in line with progress.

The nature of the poultry industry is such that widespread improvement can be brought about soon after new knowledge is discovered. To illustrate, a larger number of progeny can be obtained from a mating than with any other class of livestock. This within itself is highly significant because it aids in the identification of superior individuals as well as in their reproduction. A recent scientific development that may aid further in this respect is the use of artificial insemination.

When a superior individual or family of birds has been identified through the various means it is possible for breeders and hatcherymen to utilize this blood extensively in the reproduction of flocks. This principle is applied most effectively by hatcherymen who year after year use males from key flocks to head their egg-supply flocks. In this manner the hatcheryman influences the production and breeding qualities of chickens on every farm whose owner bought chicks of him. It is not possible for breeders of other classes of livestock to affect so extensively the quality of stock produced in the community, county, State, or nation.

The second long-time objective is to improve the production and breeding qualities of our poultry. In 1935 the estimated average yearly production for hens in the United States amounted to only 82 eggs. But in many flocks the average egg yield for that year was more than twice this number of eggs. Records kept on both commercial and farm flocks indicate definitely that there is a positive relationship between the number of eggs produced by hens and the amount of money made from the poultry enterprise. The number of eggs produced by each bird could, no doubt, be increased to some extent by feeding a more complete ration, by housing the birds more comfortably and by managing them more efficiently but since the ability to lay a large number of eggs and produce high-quality meat are inherited characters it is necessary to pay attention to the breeding problem.

This objective cannot be attained except by a wider distribution, and more extensive use of the best breeding stock. At the present time a large number of U.S. R.O.P. males are used to head U.S. Certified flocks, but there is not a sufficient number of such flocks. Consequently, the number of U.S. Certified hatcheries is quite limited. Furthermore, we would like to see a larger number of U.S. Certified cockerels used to head U.S. Approved flocks. Any movement that will stimulate the use of U.S. Certified cockerels or male birds from a higher breeding stage is worthy of consideration and support.

To accomplish this goal the principles included in the breeding phases of the program must be fundamentally sound and a relatively large number of breeders, hatcherymen and flock owners must participate in each of the breeding stages of the plan. Extensive participation cannot be brought about unless those who are taking part produce and sell meritorious products to their customers. Furthermore, active and enthusiastic support must be given to the program by all participants as well as by the administrative officers in each and every State. Passive support will not accomplish the results desired. Although we are well pleased with the extent of participation and with the support shown in the breeding stages of the plan we are not entirely satisfied. We have observed that in some of the States there is a question as to whether or not there is need for one or more of the breeding stages. It is rather surprising to know that there are certain record-of-performance breeders who have not only failed to avail themselves of the Certified breeding stage but have been more or less passive in their attitude toward it. If U.S. R.O.P. breeders themselves do not see the merits of the Certified stage how may they reasonably expect hatcherymen or others to buy U.S. R.O.P. males to head their breeding flocks?

Another breeding problem we have in common with official State agencies is to come to an agreement on what constitutes good enough quality, type, and color in some of the breeds, especially in the parti-colored and general-purpose breeds, in order to have them qualify for the different breeding stages. At the present time a U. S. Certified Rhode Island Red in one State should be eligible for the same breeding stage in any other State. A bird cannot be a Rhode Island Red in one State and a New Hampshire in another State. Any differences in opinion may be based upon superficial characters but they are great enough in some cases to cause confusion and a loss of confidence on the part of purchasers. In my opinion, much good would come out of our holding demonstrations on flock selection at one or more of our national conferences. It was demonstrated at last year's conference, and I am confident the same will be true this year, that by discussing our mutual problems frankly with each other a satisfactory agreement can and will be reached. This is especially true if we again exercise tolerance and have an appreciation of each other's viewpoint.

The third specific objective is to decrease losses from pullorum infection. During the last two seasons many of us have seen definite steps taken to make pullorum-testing work more efficient. Much remains to be done along this line but it has been a source of satisfaction to see this work placed on a more scientific and systematic basis. We believe all those who have underway a constructive breeding program should likewise have in progress an efficient pullorum-testing program. Although the national plan does not make it obligatory for both breeding and testing work to be done simultaneously, many of the official State agencies require testing work to be done in connection with all breeding operations. In such States the problem of administration in relation to advertising in particular is simplified and prospective purchasers can more nearly understand the advertising material.

The fourth objective of the National Poultry Improvement Plan is to identify authoratively with uniform terminology the breeding stock, hatching eggs, and chicks which are produced in accordance with the provisions of the plan. To do this the prefix "U. S." has been reserved in connection with other terminology for the exclusive use of those who are participating in the plan. In addition, a national emblem has been designed for those who are taking part in the program. In addition to producing meritorious products breeders and hatcherymen who are taking part in the plan should be interested in educating prospective purchasers on the terms used and their significance.

We have been advised that some of the States did not even issue a list of those who were participating in the program this past season. Furthermore, the prefix "U. S." and the national emblem were used but little, if at all, in a few of these States. Above everything else, those of us in the Federal service who are concerned with the administration of the plan are eager to make it worthy of support. After this we believe it is the responsibility of participating members of the industry to acquaint prospective purchasers with their products by the use of the correct terminology.

The fifth objective is to bring about compliance with the provisions of the paln. It is quite obvious that confidence in this program cannot be created and maintained unless all the administrative officers, both State and Federal, take every precaution and exercise diligence to see that all of the provisions of the plan are complied with. The plan is nation-wide in scope. Its provisions apply to every State and every participating member of the industry in exactly the same manner. For these reasons the inspection service called for in the plan should be carefully and deliberately done.

Since the ultimate success of the National Poultry Improvement Plan depends almost entirely upon the educational work connected with it, we believe it is desirable for the official State agencies to sponsor an extensive educational program on the work of the plan in cooperation with the educational agencies of each State. Such a program will be to the interest of those who produce and sell breeding stock, hatching eggs, and chicks, and will enable the buyers of these products to know and appreciate the objectives of the National Poultry Improvement Plan.

The State supervisors and the State inspectors probably carry the burden of responsibility for the success of the National Poultry Improvement Plan in most of the States. But it occurs to me that the personnel of each official State agency should indicate in no uncertain manner that it is willing to lend not only moral but financial support to the program and the work of their supervisors and inspectors. Such an attitude is especially important in creating and maintaining confidence in the work of the plan. Unqualified support on the part of the directing officers of the plan will also aid greatly in obtaining more extensive participation in the plan and in bringing about compliance with its provisions.

In conclusion, permit me to say that the National Poultry Improvement Plan is a medium through which breeders, hatcherymen, and farmer-producers may mutually cooperate in developing a most constructive breeding and pullorum-disease-control program that will be to their interest and to the advantage of those who buy breeding stock, hatching eggs, and chicks, as well as those who buy poultry products for consumption. With a continued willingness to cooperate with each other, I am confident this program will be developed and administered in the interest of both producers and consumers.

GROWTH AND VARIABILITY IN WEIGHT OF PULLETS AND HENS

By Walter A. Hendricks and Charles W. Knox, Bureau of
Animal Industry, U. S. Department of Agriculture.

In view of the fact that the live weight of a bird is one of the characters which determines her standing in R.O.P. work, it may be well to devote some time to a study of essential considerations involved in the measurement of this character. The process of growth and development, as observed in the domestic fowl, is doubtless familiar to many members of this group. A typical growth curve, obtained by plotting the average live weights of 29 Rhode Island Red pullets against time for a period extending from the hatching date to about the end of the first laying year, is presented in Figure 1. These pullets were used in nutrition investigations of the Bureau of Animal Industry at Beltsville, Md., but were kept under conditions approximating those found on commercial poultry farms.

During the first 18-week period one can distinguish the familiar S-shaped trend of early growth which has been of so much interest to mathematically minded physiologists. This is followed by the revived acceleration of growth rate which heralds the approach of sexual maturity. The curve shows a fairly consistent increase in live weight up to about March 1. Thereafter, live weight tended to remain at a constant level, with minor fluctuations, until about May 1, after which a consistent downward trend may be observed.

It is thus quite apparent that the live weight of a pullet tends to increase up to the time of maximum egg production, tends to remain constant during the winter period of heavy production, and tends to decrease during the late spring and summer months.

A more complete picture of the behavior of live weight after a bird has reached maturity is given in Figure 2. The graph gives the average live weights of 51 White Leghorns over a period including approximately the first two years of production. These birds were also used in nutrition investigations at Beltsville and kept under conditions similar to those found on commercial poultry farms.

Live weight increased up to about May 1 of the first laying year, after which it tended to remain at a constant level until about August 1. During August, September, and October the trend was consistently downward. From then on the trend was again upward until the constant level for the second laying year was reached in April. The maximum live weight for the second laying year is seen to be somewhat higher than the maximum reached during the first laying year. Except for a small increase during August, the trend of live weight shows essentially the same features during the second laying year as in the first.

Figures 1 and 2 give some idea of the average trends in live weight to be expected at various seasons of the year. They indicate that the live weights between February 1 and August 1 of the first laying year should be regarded as pullet weights, while those between February 1 and August 1 of the second laying year should be regarded as hen weights. This conclusion is based on the fact that even though the birds were more than a year old after April 1 of the first laying year, their weights tended to fluctuate about a constant value between March 1 and August 1. The higher body weight which is supposed to be characteristic of hens did not manifest itself until the winter months of the second laying year. Both the pullet weights and the hen weights seem to attain their highest values by March or April. March or April would seem to be the most favorable months for weighing birds from the point of view of meeting Record of Performance qualification requirements.

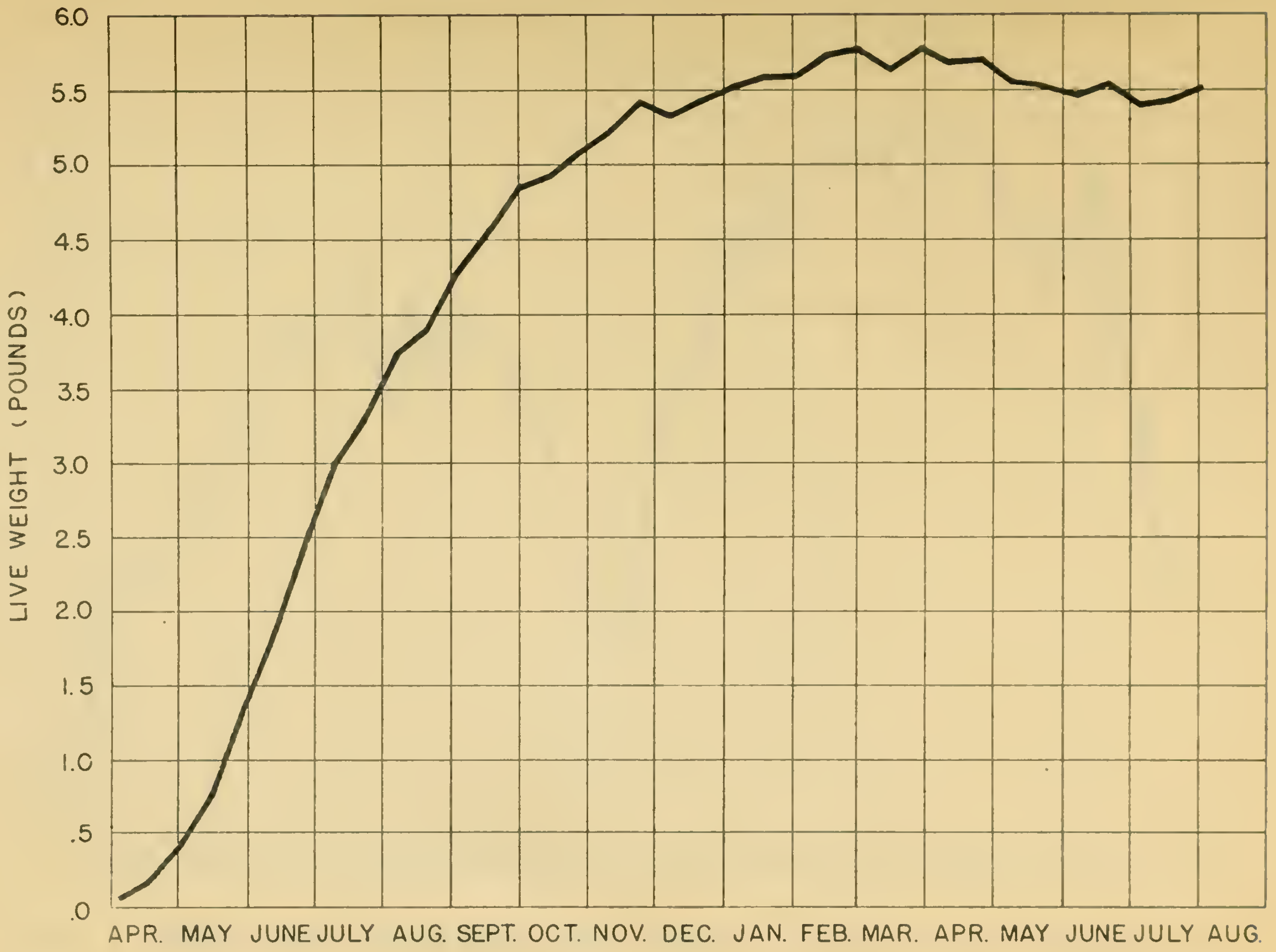


Figure 1.-Average live weights of 29 Rhode Island Red pullets.

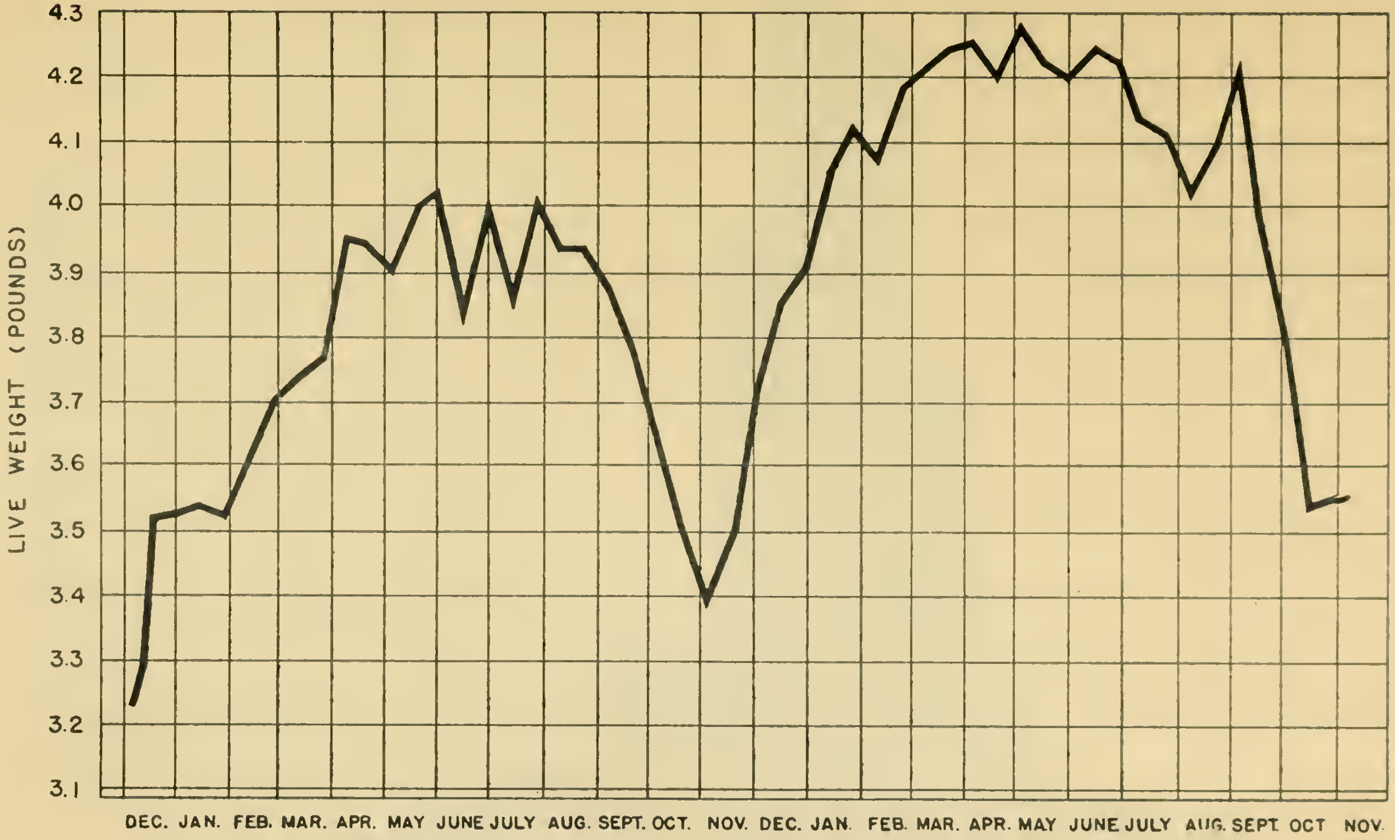


Figure 2.-Average live weights of 51 White Leghorns during first two laying years.

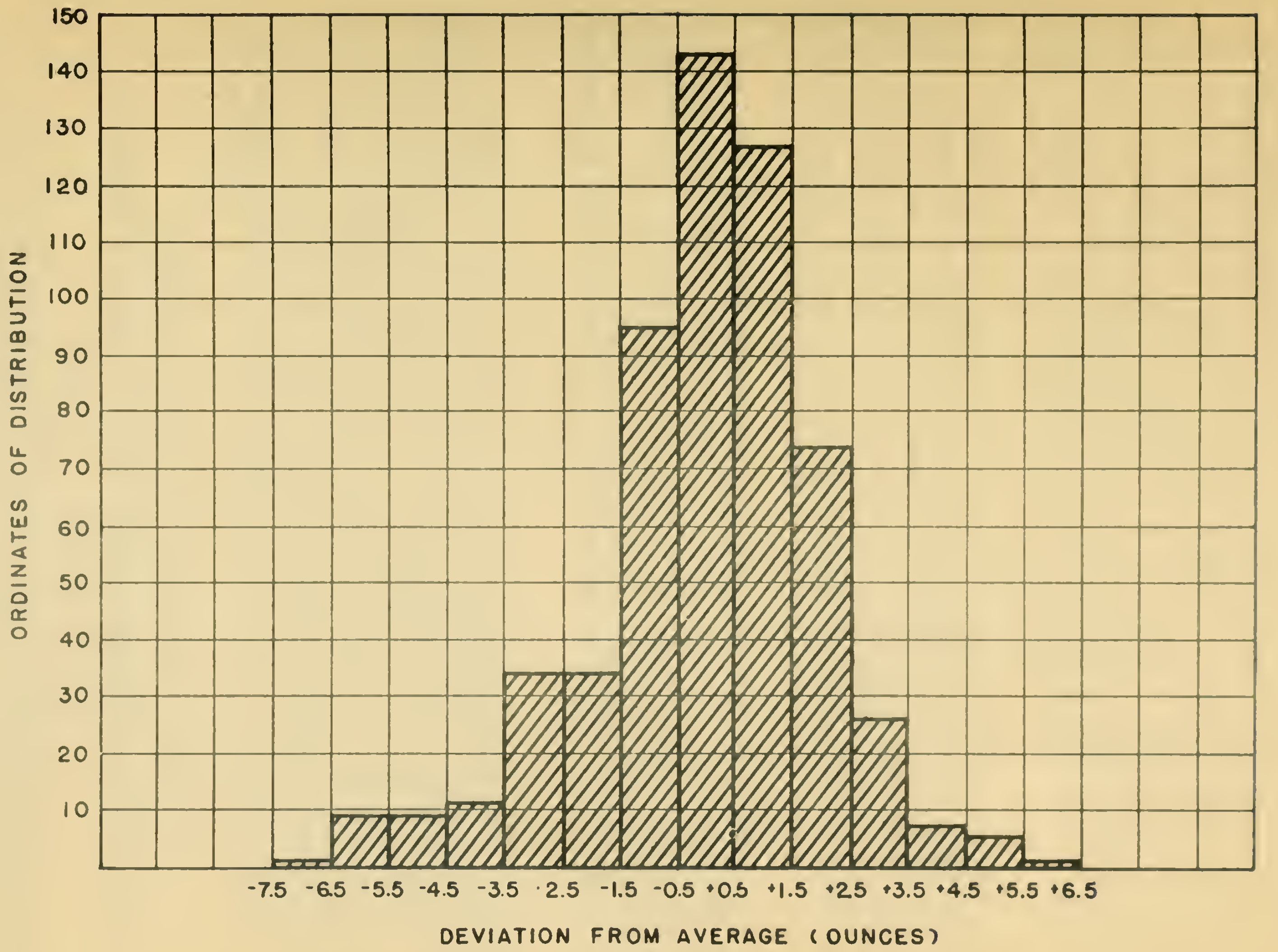


Figure 3.-Deviations of daily live weights from 16-day averages.

It may be worth while to consider another aspect of the problem of measuring live weight, namely, the reliability of a single weighing of a particular bird. Investigators at Beltsville weighed a number of laying hens individually once a day for 16 consecutive days in the month of May to determine how accurately they could be weighed. Neither feed nor water was removed from the pens before the weighings. The hens were crossbred stock of about the same weight as mature Rhode Island Reds. After eliminating the data for birds whose live weights seemed to show consistent trends, there remained a set of 576 observed live weights consisting of 16 weights for each of 36 birds. The average weight for each bird and the 16 deviations of the daily weights from this average were computed. The resulting set of 576 deviations was used to construct the frequency distribution shown in Figure 3.

The standard deviation of the 576 deviations is about 2 ounces. This serves as an estimate of the standard error of a single weighing and gives some idea of the amount by which one live weight for a particular bird is likely to be in error. For example, if each bird of a flock is weighed once on a given day, only about 1/3 of the live weights will be likely to be in error by as much as 2 ounces and 1/20 will be likely to be in error by as much as 4 ounces.

The standard error of the average of two live weights, taken in accordance with the requirements of the National Plan, is about 1.4 ounces. This means that 1/3 of the time an average is likely to differ from the "true" average by as much as 1.4 ounces and 1/20 of the time the error is likely to be as much as 2.8 ounces. The error in the average of two weighings is thus seen to be about 2/3 as great as the error made in a single weighing.

These results show that, so far as the errors in weighing are concerned, the average of two weights is not much more useful than a single weight. However, there is a consideration which makes the use of such an average desirable. An average of two weights taken at dates a few months apart may serve as an index of a bird's ability to maintain her live weight and thus yield some information regarding the vitality of the bird. This, rather than any argument relating to increased accuracy of weighing, seems to be the most important point to consider in using an average of two weights rather than a single weight for qualifying birds.

BREEDING POULTRY FOR MARKET MEAT QUALITIES

By Morley A. Jull, head of Poultry Department, University of Maryland, College Park, Md.

The title assigned to me indicates, apparently, that market meat quality, or fleshing properties, is an inherited characteristic which can be improved upon by selection and breeding. The development of tissue and the ability to deposit fat in the tissue are inherited characteristics, although practically nothing is known concerning the manner in which they are inherited. As a matter of fact practically no investigational work has ever been undertaken in this or any other country to determine the mode of inheritance of the ability to produce flesh. The quality of poultry flesh is affected to a considerable extent by the kind and amount of fat deposited within the lean tissue, and the amount of lean tissue developed depends upon the diet and methods of management in the rearing of the stock, as well as upon breeding methods.

A certain amount of investigational work has been carried on with the idea of determining the nature of the inheritance of body size, although it must be kept in mind that body size in itself is not necessarily a criterion of fleshing properties. Table 1 gives a list of the crosses that have been used by different investigators in studying the inheritance of body size.

Table 1.--Crosses made by different investigators on the inheritance of body size.

Investigators	Males used	Females used
Punnett	Golden Penciled Hamburg	Silver Sebright Bantam
Kopec	Buff Orpington	White Leghorn
Kopec	White Leghorn	Buff Orpington
Waters	White Leghorn	Light Brahma
Jull and Quinn	Black Rose Comb Bantam	Barred Plymouth Rock
Jull and Quinn	Barred Plymouth Rock	Black Rose Comb Bantam
A. J. G. Maw	Golden Sebright Bantam	Light Brahma

The first three investigators listed in table 1 used crosses where the difference in weight between the two breeds crossed was considerable, but not so great as in the case of the last two crosses listed in the table. The results of these investigations on body-size inheritance indicate that where the two parental breeds do not differ significantly in body weight the adult body weight of the progeny is approximately halfway between the weights of the two standard breeds. On the other hand, in crosses made between breeds which differ widely in body weight it has been found that the adult weight of the progeny is nearer the weight of the smaller parental breed, suggesting that there are possibly dominant genes for small body size. In addition to this it is quite apparent that from the results of all investigations on body size inheritance there must be a large number of genes involved altogether so that the question of determining the mode of inheritance of body size is an extremely complicated one.

Moreover, a number of investigators including Dr. L. C. Dunn, Dr. F. B. Hutt, Professor A. J. G. Maw, and I. M. Lerner have observed that the measurements of the appendicular skeleton of the fowl serves as a much more reliable index of the inheritance of body weight than the actual weight of the bird. Measurements of the long bones of the body, particularly, appear to be the best criteria. The results secured by different investigators indicate that there are many genes involved in the inheritance of bone length, some of the genes having a cumulative effect. It is apparent, therefore, that since the amount of flesh on the carcass is determined to a considerable extent by the size of the skeleton, whose inheritance is determined by many genes, it is readily understood how difficult it is to suggest a breeding program for the development of market meat qualities.

From a purely practical standpoint the interest in crossbreeding, especially for the production of broilers, has increased considerably. There are probably several factors responsible for the increased interest in crossbreeding, but one of the principal factors is the relatively more rapid rate of growth of the crossbred progeny as compared with purebred chicks of the pure breeds that are crossed. Not only has it been observed that crossbred progeny usually grow faster for the first 10 or 12 weeks, but it has also been found in several cases that the crossbred progeny produces on the average a better grade of dressed poultry as compared with the pure breeds. The results obtained from crossbreeding, however, depend largely upon the quality of the parental breeds crossed, and since the crossbred progeny can rarely be used for breeding purposes we are back where we started, namely, with the problem of breeding pure breeds for improved market meat qualities.

Rightly or wrongly, the dual-purpose breeds such as Plymouth Rocks and Rhode Island Reds usually command a little higher market price than Leghorns and similar breeds. It is doubtful if the marketing interests have ever demonstrated that the dual-purpose breeds possess superior market meat qualities over the Leghorns, although the preference in market price does raise a question of outstanding economic importance to the poultry industry. During recent years there seems to have been a tendency for Leghorn flocks to supplant flocks of general-purpose breeds, apparently because the egg receipts provide a larger share of total poultry receipts from the average flock than poultry meat. There are those who have assumed that the dual-purpose breeds cannot be bred for both egg and meat production qualities. At the same time no one apparently has ever demonstrated that breeding for high egg production in the dual-purpose breeds has interfered in any way with their fleshing properties. In table 2 are given the average egg production records of Black Langshans, Black Orpingtons, White Wyandottes and Light Sussex, comparable to the average egg-production record of White Leghorns. Insofar as is known, the breeding of these dual-purpose breeds for egg production does not appear to have affected their meat-producing qualities.

Table 2.--The average annual egg production per bird for each of two 3-year periods for the leading varieties in Australian and English egg-laying contests.

Item	White Leghorns	Black Langshans	Black Orpingtons
	Eggs	Eggs	Eggs
Australia (Hawkesbury Agricultural College):			
3 years, 1908-11	192	171	173
3 years, 1932-35	194	199	200
	White Leghorns	White Wyandottes	Light Sussex
England (Harper-Adams Agricultural College):			
3 years, 1922-25	186	186	169
3 years, 1931-34	187	192	166

Apparently, one of the outstanding reasons for a lack of interest among poultry breeders in the United States in breeding for improved meat quality has been the lack of stimulus to undertake such a program. The farmer and poultry breeder must be given some incentive before he can be expected to undertake a constructive program for the development of better-quality market poultry. Such a stimulus might well be afforded by the poultry packing plants or by other buyers of market poultry paying for the live and dressed poultry on a graded basis. It would be particularly desirable if the buyer of market poultry could enter into an agreement with the producer whereby the progeny of different males would be identified and a premium paid for the progeny of outstanding males, thus encouraging the development of a poultry-meat-quality breeding program on a family basis.

A similar scheme to this except that it applies to the swine industry has been in operation in Denmark for a period of years. In that country there is widespread cooperation among farmers in the improvement of their swine breeding stock for the production of bacon and ham of superior quality. The Government cooperates with the swine breeders to some extent, although the national committee in charge of swine breeding supervises the registration of swine, the registration being accepted only for animals bred at State-recognized breeding centers. At these breeding centers the swine breeders must comply with certain regulations, including sending half as many test litters as they have sows in their herds to the breeding centers or testing stations. Each test litter sent to the testing station comprises four pigs, and at the testing station they are fed under standard conditions and the rates and economy of gain are recorded in the books of the testing stations. When each pig reaches 200 pounds in weight, it is slaughtered at a nearby bacon factory and its dressing percentage and type, conformation and quality of its carcass are measured and scored by the representatives of the testing station. That is a scheme whereby the swine breeders of Denmark apply the progeny test to the boars and sows used in the swine breeding herds.

The breeding centers or testing stations are inspected twice yearly on the basis of the following points: (1) general appearance and management of the farm, (2) the body conformation of the breeding stock, (3) the fertility of the boars and sows, (4) the efficiency in the use of feed by the test pigs, (5) the quality of the dressed carcass of the test pigs from the breeding center. According to Dr. J. L. Lush, who has made a personal study of the Danish swine breeding system, the Danish Government makes a small financial contribution to a portion of the work and extends legal authority where necessary. Apparently, the Danish swine breeding system has rendered a very valuable service to the swine industry of Denmark judging by the high standing of Danish bacon on the British markets. Some scheme patterned along the same lines for the development of superior market poultry in the United States might be the only stimulus that would ever produce results on a large scale.

A QUALIFICATION RATING FOR POULTRY BREEDING STOCK

By Charles W. Knox and Walter A. Hendricks,
Bureau of Animal Industry, U. S. Department of Agriculture.

The rating of a hen for several characteristics is not a new idea. James E. Rice has advanced and disseminated information on the value of some sort of rating for a number of years. He and many other poultrymen were not satisfied with judging a hen only by her egg production. These poultrymen knew that there were other commercial characters which should be considered, such as egg weight, body weight, hatchability, and viability. Professor Rice attempted to have poultrymen adopt some standard of evaluation for these factors but they did not seem to be ready for it. He named this rating "hen load" to indicate the worth of the hen. There is considerable justification for including several characters in the evaluation of each individual instead of egg production alone.

The standard egg laying contests have recognized the need of some simple measure to be used along with egg production in rating hens. Therefore, the managers of contests inaugurated a simple point system whereby the individuals of the contest were evaluated by points rather than by egg production. This point system is rather well known and universally accepted. It is a simple system based upon the number of eggs laid multiplied by the number of points given for egg weight. The points given for egg weight per dozen eggs are as follows: 26 ounces = 1.10 points; 25 = 1.05; 24 = 1.00; 23 = 0.95; 22 = 0.90; 21 = 0.85; 20 = 0.80 and so on. The point system is probably the first one to be used on a large scale in an attempt to evaluate hen load.

The point system has considerable merit and has met with favor but there are other factors that might likewise be included. It is true that it is a relatively simple system and that including an evaluation of other characteristics would make it considerably more complicated. However, the records kept for the qualification of individuals in the U. S. Record of Performance work are ideal for the application of some such system of evaluation. There are several good reasons for having a single evaluation for multiple characteristics.

In the first place, the selection of hens for breeding purposes is a matter of the proper balance of many characteristics. No individual hen is perfect and the standard set by the breeder should not be an arbitrary one for each characteristic. For instance, if a hen lays 300 eggs and the average egg weight is 23.8 ounces per dozen, this hen cannot qualify for R. O. P. This is due to the fixed standard of 200 eggs of 24 ounces to the dozen average. However, most breeders can ill afford to eliminate such a bird from an R. O. P. mating. It would be much better to have some kind of evaluation figure that would give proper weight to these characteristics. The standard egg laying contests would figure, by their point system, that this particular hen was a 297 point hen. This is fairer both to the hen and to the breeder.

When a fixed standard of each characteristic is used it is practically impossible to obtain a proper balance of these characters for the selection of worthwhile breeders. No doubt, each standard developed gradually and without regard to other characteristics. Development of the standard for egg production was based on the fact that good egg production flocks produced approximately 200 eggs per bird. In such flocks it may be assumed that 50 percent of the pullets laid over 200 eggs. At least 15 percent of this number must qualify for breeders in order to reproduce and maintain the size of the flock. This leaves a good margin to produce eggs and stock for sale. A similar condition is true in respect to egg weight where the flock average is 2 ounces. This is presented graphically by actual data compiled in Figure 1 from a Single Comb White Leghorn flock. It will be noted that these graphs are quite similar. In respect to egg production 46.8 percent laid 200 eggs or more and in regard to egg weight 49.8 percent laid eggs that averaged 24 ounces or more to the dozen. This would seem to be a reasonable standard for reasons already explained. However, when the two characteristics are considered together only 18 percent of the hens laid 200 or more eggs that averaged 24 ounces or more a dozen.

Qualifying only 18 percent of the birds does not allow enough margin for the sale of very many hatching eggs, chicks, and adult stock. Some poultrymen might think that 18 percent is obtained only in poor flocks. However, data compiled from the March issue of the Hatchery Tribune show that 18 percent is above the average percent of pullets that qualified in U. S. R. O. P. when the percentage is calculated on the basis of pullets on the farm. The data in table 1 show the various breeds for which complete data were obtained and the percent that qualified after the 60-day trial period and of the number of pullets on the farm. It is readily seen from this table that it is impossible to replace the pullets on R. O. P. farms with pullets from R. O. P. stock to say nothing about having a surplus of hatching eggs, chicks, and breeding stock for sale.

Table 1. Official 1935-36 R. O. P. flock records.

Breed and variety	No. pullets on farms	Original no. pullets trapped on farms	Pullets entered in R.O.P. after 60 days trapping	No. pullets qualified in R.O.P.*	I Percent qualified of 60 days' trial	II Percent qualified of total
S.C. White Leghorns	57,178	31,175	27,247	7,725	28.35	13.51
S.C. Rhode Island Reds	49,244	14,315	10,205	3,525	34.54	7.16
Barred Plymouth Rocks	16,648	6,197	5,145	1,486	28.88	8.93
New Hampshires	16,716	2,110	2,110	526	24.93	3.15
White Plymouth Rocks	4,009	2,211	1,948	460	23.61	11.47
White Wyandottes	2,633	1,881	1,545	145	9.39	5.51

*Produced 200 eggs or more yearly that weighed at least 24 ounces per dozen.

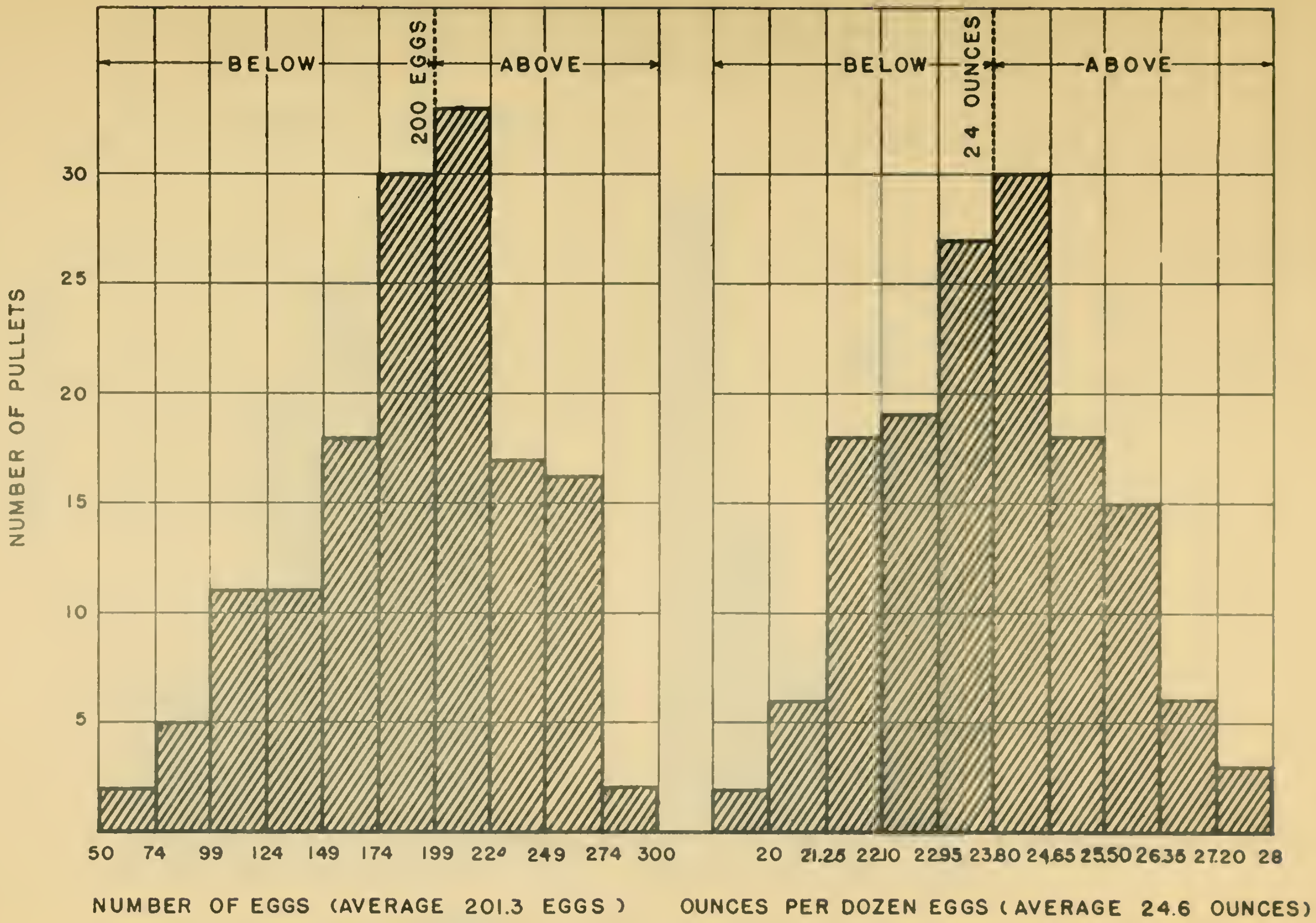


Figure 1.-Histogram of Egg Production and Egg Weight in a Single Comb White Leghorn Flock.

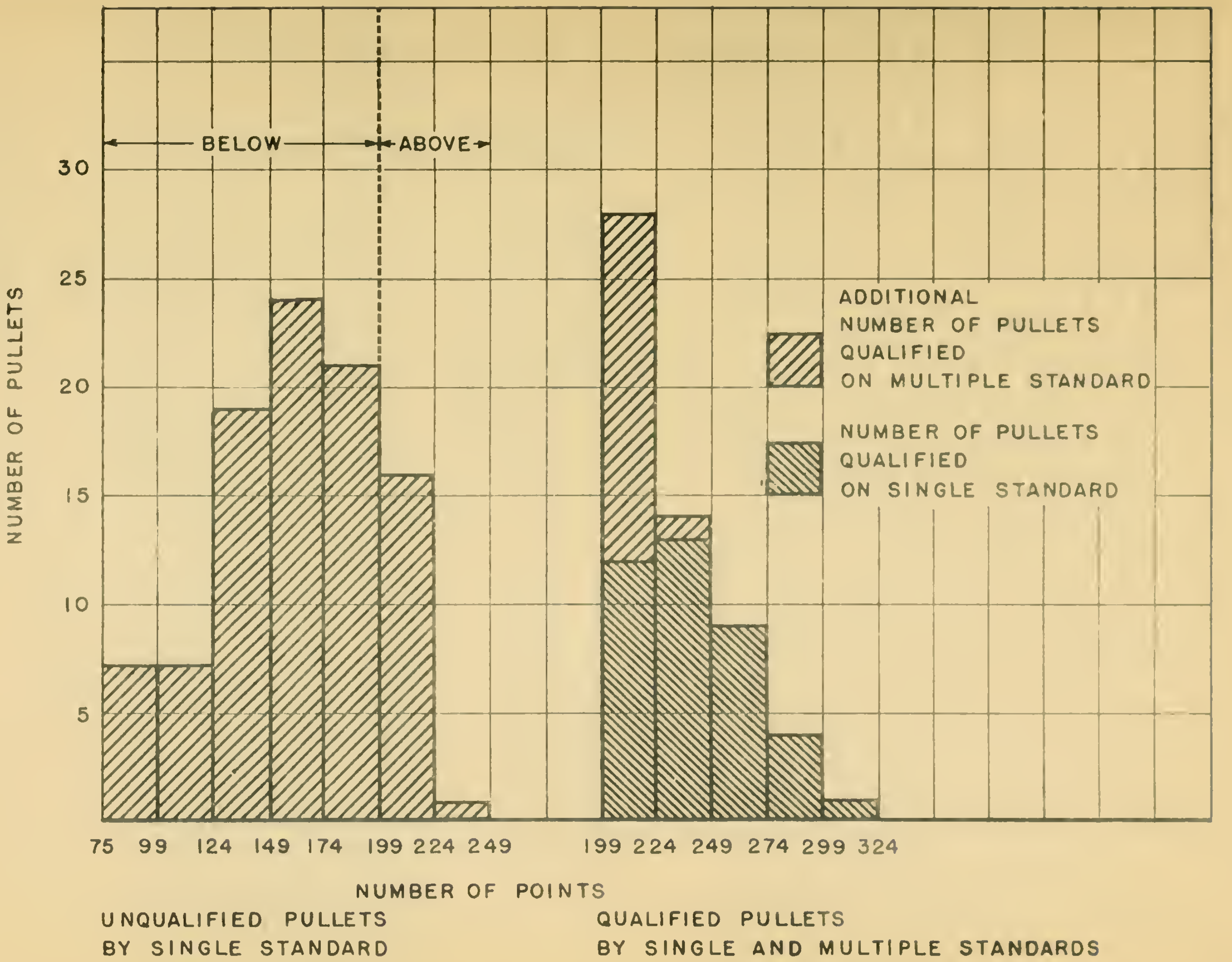


Figure 2.-Number of Single Comb Leghorns Qualified by Single and Multiple Standards.

Because of the single fixed standard some of the White Leghorn breeders state that an average of 24 ounces to the dozen eggs is too high and too arbitrary and that they do not get any extra premium for 2-ounce eggs or better. Of course, it may be barely possible that the Leghorns, being of smaller body weight than Rhode Island Reds, Plymouth Rocks or similar breeds, would tend to lay smaller eggs and possibly a greater number of them. A proper evaluation of these characteristics might give proper value to each of these characters and form a better basis on which to select the hen as a breeder. Poultrymen keeping heavier breeds of fowl than White Leghorns are usually satisfied with the egg weight requirements of R. O. P. but many of them believe that the egg-production requirements are too high. This condition may be due to the fact that the heavier a hen is the greater the tendency to lay fewer eggs. If a certain standard for R. O. P. qualifications is chosen it should take care of reasonable requirements and preserve a balance for the selection of breeders to be used in R. O. P. breeding pens. Scientists and poultrymen are aware of the fact that, on the average, within the breed the larger pullets tend to produce fewer eggs than the smaller pullets but the eggs tend to be larger. They also know that the more eggs a pullet lays, the smaller will be the eggs produced. Hence, in any system of evaluation of hen qualifications, it is desirable to consider the following:

1. Small pullets are more likely to lay small eggs.
2. Small pullets usually produce a larger number of eggs than larger pullets.
3. Large pullets usually lay good-sized eggs but fewer of them than smaller pullets.
4. The more eggs produced, the more likely they are to be smaller in size and vice versa.

The requirements for U. S. Record of Performance qualifications and the data that are collected for this breeding stage of the national plan afford an excellent opportunity for the use of a system of evaluation of three characteristics, namely, egg production, egg weight, and body weight. By taking these three commercial characteristics and considering carefully the four effects as outlined above the authors have evolved a formula which evaluates them and submit it for consideration. This formula is based on the same standards as the U. S. R. O. P., i.e., 200 or more eggs, 24 ounces or more average egg weight, and standard body weight. It differs from the present standard in that it would allow inidivuals of equivalent performance to be qualified and used as breeders.

The following symbols are used in this formula:

E = Egg production
W = Average weight of a dozen eggs
B = Body weight
R = Rating

The formula used is as follows:

$$R = \frac{E(W - 14) + 70(B - 3.5)}{10}$$

The factor, $(W - 14)$, reduces the egg weight to points as in egg laying contests but with graduations of 0.1 of a point for each ounce that a dozen eggs weigh under or over 24 ounces to the dozen rather than 0.05 of a point as used in the standard egg laying contests; the 10 is used as the divisor to reduce the whole to 200 for a standard bird. In other words 200 is the qualifying value. Taking a portion of the formula, $E(W - 14)$, in order to understand it a little better, substitute 200 eggs as the standard of egg production for E and 24 ounces for W hence $\frac{200(24 - 14)}{10}$ gives a minimum index of 200. Figuring this out in consecutive steps we have the following: $\frac{200(10)}{10} = \frac{2000}{10} = 200$, the minimum standard set. Taking the last half of the formula, $70(B - 3.5)$, 3.5 pounds, the minimum body weight requirement, is substituted for B, hence the following steps: $70(3.5 - 3.5) = 70(0) = 0$. Adding this to the rest of the formula, $\frac{2000 + 0}{10} = 200$. Thus it is seen that the so-called standard is 200 eggs, averaging 24 ounces to the dozen, and a body weight of 3.5 pounds or the equivalent thereof. The substitution of these characteristics is as follows:

$$\frac{200(24 - 14) + 70(3.5 - 3.5)}{10} = \frac{2000 + 0}{10} = 200.$$

As a matter of fact it has been suggested that for each ounce under 24 ounces that a dozen eggs weigh there shall be a gradient of 0.2 of a point. This would effectively eliminate 300 egg producers that lay eggs averaging 22 ounces to the dozen. Another suggestion is to use the formula as it is and to have disqualifying limits for each character. This seems to be a better method of evaluation and we already have disqualifying limits for body weight of different breeds which can remain in effect and not influence the use of the formula. To the body disqualification clauses could be added egg-weight averages of 22 ounces or less per dozen eggs or whatever average weights the breeders would deem justifiable. In any event, the bird must equal or exceed the total evaluation of 200 points.

The value of the formula may be appraised by applying it to actual data. When a sufficient amount of data is tried, the various ramifications of such a formula may be seen more readily and its effectiveness determined. The data in table 2 show the evaluation of R. O. P. characteristics for 69 S. C. White Leghorns. It is seen that such an evaluation is fairly reasonable and that the rating calculated is in close agreement with the breeder's idea of the value of that particular bird as a breeder. This formula can be enlarged so that it might include the hatchability of the eggs produced by the individual and any other factors that might be deemed essential.

Table 2. Hen rating, based on annual production of eggs in numbers; weight of eggs in ounces per dozen; and body weight in pounds.

Band	Egg prod.	Egg wt.	Body wt.	Rating	Band	Egg prod.	Egg wt.	Body wt.	Rating
176	266	24.6	4.24	287	107	217	22.7	4.00	192
207	229	26.1	5.00	285	57	154	25.4	5.17	187
191	232	25.5	3.95	270	92	200	22.5	4.50	177
81	243	24.9	4.33	270	44	196	22.7	3.82	173
226	205	34.5	6.30	266	210	148	25.3	4.11	172
239	287	22.8	4.35	259	112	147	24.9	5.12	172
212	240	24.3	4.15	252	182	240	20.8	3.50	163
101	201	26.4	4.96	251	48	192	22.3	3.82	162
230	236	24.1	5.05	249	90	135	25.5	4.42	162
63	224	24.6	4.75	246	206	260	20.1	3.80	161
234	224	24.5	4.12	240	136	227	20.9	3.72	158
75	219	24.7	4.02	238	102	183	22.2	4.21	155
238	215	24.7	4.70	238	199	218	20.8	4.05	152
100	205	25.1	3.84	230	86	162	22.7	4.80	150
37	228	24.0	3.45	228	17	167	22.7	4.00	149
160	253	22.9	3.95	228	58	179	22.1	3.60	146
224	206	24.7	4.40	227	228	156	22.2	5.84	144
167	187	25.5	4.15	220	183	163	22.7	3.65	143
175	198	24.8	4.24	219	129	152	22.4	4.35	134
13	216	24.0	3.78	218	121	143	22.9	3.82	129
251	258	22.3	4.03	218	147	175	20.9	4.14	125
225	221	23.5	4.36	216	96	144	22.7	3.71	127
131	208	24.1	4.45	217	60	133	22.7	4.65	124
123	198	24.3	5.09	215	204	102	25.5	3.98	121
177	235	22.6	5.11	213	94	140	22.1	4.03	117
217	231	23.0	4.44	214	197	124	23.1	4.00	116
77	225	23.5	2.92	210	156	118	23.1	3.78	109
152	200	24.3	3.90	209	140	96	24.9	4.16	109
186	270	21.5	4.08	207	252	131	22.4	3.23	108
54	238	22.7	3.49	206	103	98	23.4	3.95	95
113	178	25.0	5.08	207	15	127	21.1	3.34	89
28	281	21.2	3.48	202	114	111	21.2	3.82	82
163	182	25.0	3.68	201	33	123	20.5	3.24	78
25	231	22.5	3.71	198	46	65	24.3	4.95	77
					27	77	22.7	4.05	71

$$\text{Hen Rating} = \frac{E(W - 14) + 70(B - 3.5)}{10}$$

E = Egg production
W = Egg weight
B = Body weight

R. O. P. OR PROGRESS - SOME OBSERVATIONS ON THE NATIONAL POULTRY IMPROVEMENT PLAN

by John E. Kimber, poultry breeder, director, California Poultry Improvement Association, director, California Baby Chick Association. *

(Note: This paper though not on the conference program is included by reason of action of the conference outlined in the report which follows this paper.)

A Crisis in the Poultry Industry

During the past few years a movement has been spreading to place all poultry breeding work in the United States, terminology, etc., on a uniform basis in order to "authoritatively identify" products offered the industry by breeders and hatcheries, so that the purchaser of hatching eggs and baby chicks will be better able to know what he is buying. Another purpose of the plan is to check dishonest advertising and misleading claims as well as the falsification of poultry breeding records, in order to protect the purchaser against fraud and the producer against "unscrupulous competition."**

The National Poultry Improvement Plan has already been adopted by 41 States. California is one State which has not so far adopted the plan. The plan is supposed to be "voluntary" both as regards participation by any State, and also as regards participation by any individual breeder or hatchery within any State. Although California has several of the world's leading breeders, and several of the world's largest and most progressive hatcheries, including the oldest commercial hatchery in the United States, no breeder or hatchery in this State has as yet elected to operate under the national plan.

Report of the California Committee

Two years ago a large committee of the foremost poultry leaders in this State, including not only leading breeders, hatcherymen, and commercial poultrymen, but also several representatives of the Poultry Division and the Veterinary Science Division of the University of California, met, held public meetings in several parts of the state, studied the plan from numerous angles, and finally unanimously recommended that the plan as submitted be "unqualifiedly rejected."

It should be pointed out that there was no ulterior motive in such recommendation. California poultrymen are under the handicap of having to ship their eggs all the way across the United States and pay a transportation differential of approximately 11 cents per dozen over eggs from eastern poultry farms. It will easily be seen that this means that California poultrymen are under a handicap amounting to almost $1.00 per hen per year, according to the most conservative estimates, as compared with eastern producers, and it takes quite a lot of California climate to overcome such a handicap.

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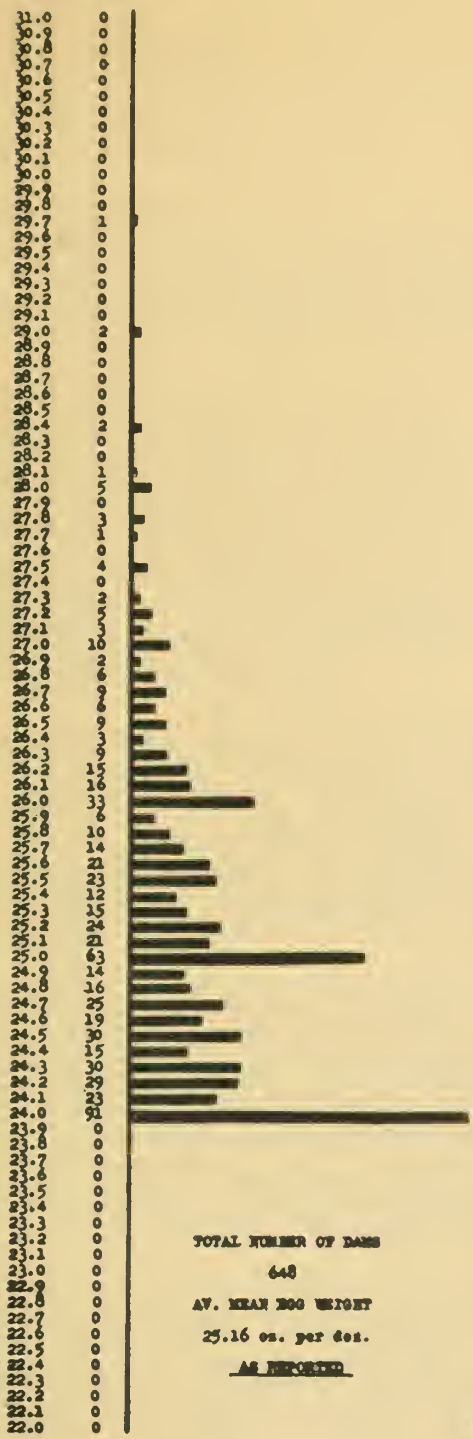
* Grateful acknowledgement is hereby made to the various distinguished authorities in the fields of mathematics and biology who have rendered valuable assistance in the preparation of this paper.

**Copies of the plan may be obtained from the U.S.Department of Agriculture, Washington, D.C.

MEAN EGG WEIGHTS (IN OZ. PER DOZ.) OF HENS USED IN 1937 INDIVIDUALLY PEDIGREED MATINGS

DATA PUBLISHED BY BREEDER B



MEAN EGG WEIGHT	NO. OF DAMS USED
31.0	0
30.9	0
30.8	0
30.7	0
30.6	0
30.5	0
30.4	0
30.3	0
30.2	0
30.1	0
30.0	0
29.9	0
29.8	0
29.7	1
29.6	0
29.5	0
29.4	0
29.3	0
29.2	0
29.1	0
29.0	2
28.9	0
28.8	0
28.7	0
28.6	0
28.5	0
28.4	2
28.3	0
28.2	0
28.1	1
28.0	5
27.9	0
27.8	3
27.7	1
27.6	0
27.5	4
27.4	0
27.3	2
27.2	5
27.1	3
27.0	10
26.9	2
26.8	6
26.7	9
26.6	6
26.5	9
26.4	3
26.3	9
26.2	15
26.1	16
26.0	33
25.9	6
25.8	10
25.7	14
25.6	21
25.5	23
25.4	12
25.3	15
25.2	24
25.1	21
25.0	63
24.9	14
24.8	16
24.7	25
24.6	19
24.5	30
24.4	15
24.3	30
24.2	29
24.1	23
24.0	91
23.9	0
23.8	0
23.7	0
23.6	0
23.5	0
23.4	0
23.3	0
23.2	0
23.1	0
23.0	0
22.9	0
22.8	0
22.7	0
22.6	0
22.5	0
22.4	0
22.3	0
22.2	0
22.1	0
22.0	0

TOTAL NUMBER OF DAMS

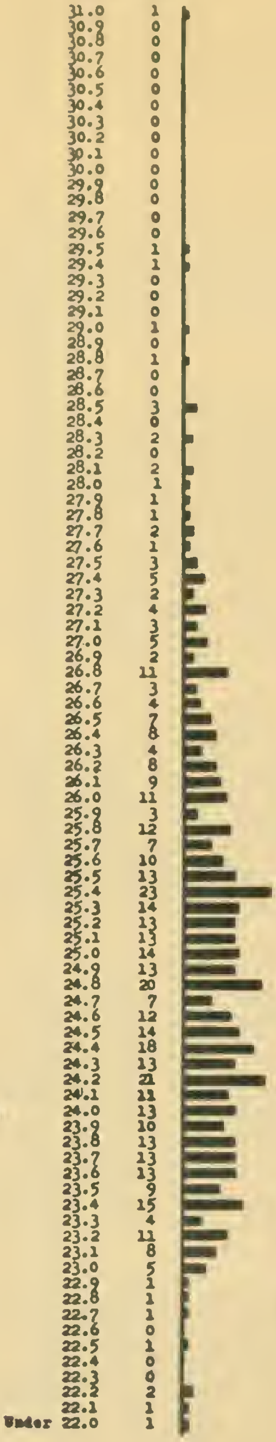
648

AV. MEAN EGG WEIGHT

25.16 oz. per doz.

AS REPORTED

DATA FROM KIMBER POULTRY BREEDING FARM



MEAN EGG WEIGHT	NO. OF DAMS USED
31.0	1
30.9	0
30.8	0
30.7	0
30.6	0
30.5	0
30.4	0
30.3	0
30.2	0
30.1	0
30.0	0
29.9	0
29.8	0
29.7	0
29.6	0
29.5	1
29.4	1
29.3	0
29.2	0
29.1	0
29.0	1
28.9	0
28.8	1
28.7	0
28.6	0
28.5	3
28.4	0
28.3	2
28.2	0
28.1	2
28.0	1
27.9	1
27.8	1
27.7	2
27.6	1
27.5	3
27.4	5
27.3	2
27.2	4
27.1	3
27.0	5
26.9	2
26.8	11
26.7	3
26.6	4
26.5	7
26.4	8
26.3	4
26.2	8
26.1	9
26.0	11
25.9	3
25.8	12
25.7	7
25.6	10
25.5	13
25.4	23
25.3	14
25.2	13
25.1	13
25.0	14
24.9	13
24.8	20
24.7	7
24.6	12
24.5	14
24.4	18
24.3	13
24.2	21
24.1	11
24.0	13
23.9	10
23.8	13
23.7	13
23.6	13
23.5	9
23.4	15
23.3	4
23.2	11
23.1	8
23.0	5
22.9	1
22.8	1
22.7	1
22.6	0
22.5	1
22.4	0
22.3	0
22.2	2
22.1	1
Under 22.0	1

TOTAL NUMBER OF DAMS

480

AV. MEAN EGG WEIGHT

25.00 oz. per doz.

bitrary R.O.P. Restrictions	Freedom From Arbitrary Restrictions
staken Breeding Procedure	Enlightened Breeding Procedure
ny Valuable Birds Outlawed	No Valuable Birds Outlawed
ximum Breeding Costs	Minimum Breeding Costs
eat Temptation to Falsify Records	Little Temptation To Falsify Records

WHICH DOES THE POULTRY INDUSTRY REALLY WANT?

California eggs have frequently commanded a premium on the New York market over "nearby hennery whites" produced within a few miles of New York City. California eggs have been so carefully graded for uniformly high quality and have been so carefully handled from the time they were laid to the time they were offered on the New York market that they have won an enviable reputation among eastern buyers. But an 11-cents-per-dozen handicap does and will continue to exist.

Now California poultrymen can remain in business under such a handicap only by having the best birds they can obtain anywhere at any price within reason. And California breeders and hatcheries can stay in business only by supplying California commercial poultrymen with better birds than they can buy from breeders and hatcheries elsewhere.

The sole and exclusive question is: "Can better birds be produced under the National Poultry Improvement Plan, or independent of it?" In the last analysis this depends in turn upon whether the National Poultry Improvement Plan is of such a nature as to result in the development of superior values. If the plan assures superior values, California breeders and hatcheries simply cannot afford *not* to come under it. If, on the other hand, the plan *interferes* with the development of superior values, if it increases costs without increasing values, then California breeders and hatcheries *cannot afford* to come under the plan.

It should be emphatically stated that the matter of honesty and dishonesty hardly enters the picture in California. There may be some unscrupulous operators in this State, as there undoubtedly are everywhere, but any notion that the reason that the large committee of poultry leaders in this State unanimously rejected the plan as submitted, was because they were unwilling to submit to official investigation of breeding and sales records, is an erroneous notion.

Careful study of the national plan indicated that in its present form it does definitely interfere with the most progressive breeding work. It is true that the lower stages of the plan, the "U. S. Approved" and "U. S. Certified" stages, are undoubtedly worth while. They provide for the careful culling of hatchery flocks used for multiplication purposes on a mass selection basis, and undoubtedly careful culling of such flocks is very important. The principal objection to the lower stages is that they require such flocks to be mated to males produced under the plan.

But true breed improvement does not depend so much on close culling of hatchery flocks used for multiplication purposes as it does upon the precision measurements, genetic analyses, and improved hereditary combinations made by foundation breeding establishments. An army whose intelligence division, observation planes, and front line of attack, were permitted to advance only as fast its rear guard would not win very many wars.

What Is The National Plan?

The National Poultry Improvement Plan is an attempt (1) to standardize breeding procedure; (2) to set up an elaborate system of inspection of flocks and hatcheries by official inspectors who visit the premises of the breeder or the hatchery several times a year, trap-nest and cull the breeder's chickens, check his records, "vouch" for their honesty and accuracy, and in various other ways supervise the operations of breeders and hatcheries who "voluntarily" place themselves under the plan. (3) The plan also provides at great length for the blood testing of flocks in order to control pullorum disease. Since this is primarily a matter of sanitation rather than heredity or breeding, we will not consider the pullorum control phase of the plan further except to say that the national plan has no monopoly on blood testing, that for years many flocks not under the plan have been entirely free from pullorum disease, and that it should be remembered that pullorum disease may easily be reintroduced into a clean flock in any one or more of numerous ways. Flocks which are unfortunate enough to have this happen in spite of every precaution are, under the plan, publicly branded and stigmatized far more than the merits of the case might warrant. Careful blood testing should be a matter of enlightened self-interest on the part of breeders and hatcheries. Blood testing plus thorough fumigation has been found to control pullorum disease to the point where losses from pullorum are insignificant. We do not believe it is necessary to set up State and national organizations in order to control pullorum disease which, after all, is only one of many diseases which cause loss to the industry.

The plan provides for several breeding stages. The two lowest, "U. S. Approved" and "U. S. Certified", provide for the hand culling on a mass selection basis of hatchery flocks. We have no particular criticism to make of these lower stages of the plan except to insist that the provision requiring flocks to be mated to males produced under the plan is not sound (because, as will be shown, the higher stages of the plan are not sound.)

It is with the higher stages of the plan that we are concerned, namely, "R.O.P." -- "Record of Performance" -- and "R.O.M." -- "Register of Merit". These higher stages, in our opinion, accomplish exactly the opposite of their professed objectives and make

The Cure Worse Than the Disease!

It is not the worthy objectives of the plan with which we are in disagreement; it is the unsound manner in which it is proposed to accomplish these worthy objectives.

R.O.P. Is Genetically Unsound

The plan permits breeders to submit for official R.O.P. testing a portion of their better birds, and requires official inspectors to cull such birds heavily, on numerous grounds, thus destroying the random sample. One of the first principles of the best genetic procedure is that a random sample of the daughters in a family must be measured. Measurements of the performance of the bad and indifferent daughters as well as the good must be included in the family averages. Testing only hand-picked birds does not give accurate family measurements which are essential for the best results.

The destruction of the random sample prevents accurate appraisal of the worth of each family. If this is prevented, maximum results cannot be expected. The national plan prevents such accurate measurements, especially of such matters as family livability.

R.O.P. Sacrificies Much Valuable Breeding Material

The arbitrary restrictions and ill-advised criteria for selection under R.O.P. cannot compel the rejection of much valuable breeding material even in the finest flocks. The theory on which such rejection is based is the unsound notion that in order to produce satisfactory offspring a hen must herself meet certain arbitrary minimum specifications, such as the requirement that she must lay eggs that have a mean egg weight of 24 oz. per dozen.

We contend that many highly valuable hens whose mean egg weight is less than 24 oz. per dozen, *if properly mated* to males from lines carrying plenty of surplus egg size, will produce sons and daughters that, on the average, will inherit and *will transmit* entirely satisfactory egg size.

Based on the normal distribution of hens in the different egg-weight classes in flocks carrying satisfactory mean egg weight, from 20 percent to 25 percent of the birds that in all other respects would constitute outstanding breeding material would have to be completely sacrificed as seed stock under R.O.P. (See graph of distribution of birds in Kimber flock. Note: A number of our matings are strictly experimental, both our largest and our smallest egg lines falling in this group.)

If it be remembered that there is a negative correlation between number and size of eggs, it will be realized that the rejection of *all* hens with mean egg weights of less than 24 oz. per dozen tends to *outlaw* some of the highest record hens in every flock.

R.O.P. Confuses Processes With End Products

IT is sound enough for the Government to test and approve *end products*, such as "92 score butter", the tensile strength of steel, etc., but it is quite another matter for the Government to prescribe or approve the breeding procedure by which the cows are developed which produce the butter, or the formulae to be followed by steel manufacturers if they would have their products approved.

It is how bloodlines are combined which determines the nature of the offspring, rather than the actual performance of either parent in any one respect, just as it is the finished cake which is important, rather than the physical properties of the separate ingredients that go into it.

Breeding at best is a matter of compromise. The perfect bird does not exist, still less the perfect family or strain. The most intelligent and enlightened breeding procedure does not require the outlawing of individuals that do not meet certain ill-advised, arbitrary, minimum specifications, regardless of their other merits and the worth of the family or blood line from which they come.

The best breeding procedure provides for making such precision measurements of the economic performance and biological soundness of individuals and families as will enable one to appraise their probable breeding worth as accurately as possible. it then becomes possible to select birds for what they can contribute and to mate them intelligently in such a way as to combine lines that will best supplement each other's strengths and weaknesses. The final step is the accurate testing of the resulting progeny to determine whether the preceding steps were successful, and we have pointed out the culling provisions of R.O.P. prevent such accurate testing.

R.O.P. Does Not Assure Superior Values

For the foregoing and many other reasons, R.O.P. and R.O.M. cannot be expected to result in the development of as good seed stock as can be produced, eventually at least, by breeders who are not hampered by the unfortunate and mistaken procedure and notions of the present R.O.P. plan.

Furthermore, even the highest stages of the plan (R.O.P. and R.O.M.) do not make the slightest provision for measurement of livability, although high mortality is the most serious problem confronting the poultry industry today. Since the plan does not provide in any way for the measurement of livability or selection for low mortality, it does not assure that the purchaser will get birds possessing high livability, which is fully as important as high production.

Yet the commercial poultryman today wants birds that will live as well as lay. If the plan makes no provision whatever anywhere for selection for high livability, how can it assure the poultryman birds that will live better than those produced independently? Obviously it cannot, yet the sponsors of the plan imply to the industry that it assures superior birds!

Even the most ardent advocates of R.O.P. will admit that nothing in the entire national plan adds particularly to the effectiveness of their own foundation breeding programs, except indirectly inasmuch as competition is suppressed and the sale of their R.O.P. products stimulated, thus enabling them to build up larger businesses. In other words, superior results depend absolutely on advanced work not provided for by the plan. Yet, we repeat, the sponsors of the plan represent to the American poultry industry that the plan assures superior values!

A Test of Five Strains

A California poultryman, who was formerly a high executive in a great manufacturing concern, made a careful test of the relative merits of independent and R.O.P. strains. 500 chicks of similar grade and cost were purchased from each of two independent breeders and each of three of the most famous R.O.P. breeders. All the chicks were received within a few days of each other, so that the date of hatch was approximately the same. None appeared to be damaged in transit, and chick livability was excellent in all groups for the first several weeks. All were given absolutely identical environmental conditions, were housed in adjacent and exactly similar sections in a new poultry house built on land where no other chickens had been known to be kept before. The birds were all cared for by the same attendant, fed the same ration, and later trap-nested by the same trap-nester. All were exposed to the same hazards of infection, so that no lot received any special advantage over any other. Unfortunately a serious epidemic of colds swept through the entire five pens in midwinter, causing many of the birds to go out of production for the year. Unusually careful records were kept of mortality and production. Every death was recorded, a large proportion of the birds being carefully autopsied, some of them by the University of California at Berkeley. Unfortunately the poultryman felt it necessary to cull the worst birds, the principal reasons for culling being excessively small egg size and apparent sickness. The results were as follows:

Table No. 1	Strain No. 1: Independent	Strain No. 2 Independent	Strain No. 3: R.O.P.	Strain No. 4: R.O.P.	Strain No. 5: R.O.P.	Totals and averages
Original No. of chicks	515	504	505	505	505	2534
No. of pullets raised	236	209	201	166	181	993
Percent pullets raised	45.8	41.4	39.8	32.8	35.8	39.1
Total eggs laid, 1st year	41,826	31,159	27,468	21,823	18,815	141,091
Av. no. of eggs per hen	177.2	149.8	136.6	131.4	103.9	142.08
No. hens died	44	49	68	44	39	244
No. hens culled	26	41	45	55	103	270
No. died and culled	70	90	113	99	142	514
Percent died	18.7	23.4	33.8	26.5	21.5	24.52
Percent culled	11.0	19.6	22.3	33.1	56.9	27.1
Pct. died and culled	29.6	43.0	56.2	59.6	78.4	51.7

It should be emphasized that the three R.O.P. breeders from whom chicks were obtained are three of the most distinguished and successful R.O.P breeders in the United States. They do not operate small or comparatively unknown breeding establishments. They have won numerous egg-laying contests and are still winning them.

A second similar trial might give different results, for there is a certain amount of experimental error even in a group of 2,534 chicks, but it is significant that the birds from both independent breeders outlived and outlaid the birds purchased from each of the three R.O.P. breeders.

Yet R.O.P. Increases Costs

R.O.P. adds materially to cost of production without corresponding increase in values. On this point Mr. R.W. Bishop, a leading R.O.P. breeder, has himself shown that R.O.P. chicks cannot be produced for less than 80 cents to $1.00 each, but that such a price is justified because the hatcheryman can pass the cost on to the purchaser, who in turn will be willing to pay more for chicks sired by R.O.P. males -- until, we must add, the poultryman discovers that R.O.P. does not mean better birds!

But there are other hidden costs in the R.O.P. system, such as the unwise rejection of much valuable breeding material. If one bird out of every five is rejected under R.O.P. on grounds which are not justified, then breeding costs are increased approximately 25 percent to the poultry industry. It is easily possible that more than one bird out of every five will be rejected under R.O.P. that would not otherwise be rejected, in which case breeding costs would be increased even more than 25 percent.

Perhaps the greatest cost of all is failure to achieve breeding objectives which the unwise restrictions imposed by R.O.P. make it difficult if not impossible to achieve, but which are not only possible but entirely probable if breeders are permitted to feel their own way along and make advances along any line they are able.

Plan Supposed To Be "Voluntary"

We are well aware that the plan professes to be "voluntary", both as regards participation by any State and as regards any breeder or hatchery in any State. But when the great weight of governmental endorsement is given so unreservedly to the plan, when R.O.P. breeders here aided in securing a near-monopoly of the business of producing pedigreed hatching eggs and baby chicks for seed-stock purposes although nothing in the plan requires them to merit such monopoly, when tremendous pressure is put on independent breeders and hatcheries to "get in step", when independent breeders' most important markets are being undermined and the industry led to question their integrity at the same time that official inspectors are "vouching" for the honesty of R.O.P. breeders, and State educational institutions and U. S. Government officials are enthusiastically approving them, can the plan honestly be called "voluntary" So far, perhaps. But many movements which start out as "voluntary" eventually become COMPULSORY, especially when the strong hand of governmental authority enters the picture. Can any plan be truthfully called "voluntary" if those who, for any reason whatever refuse to embrace it are destroyed?

R.O.P. Does Not Appear To Stop Dishonesty Either Outside the Plan or Under It.

Deception by the use of ambiguous terminology, such as "300 egg strain", "proven breeders", etc., is objectionable but relatively harmless. We see some very enthusiastic automobile advertising, such as "World's finest low priced car". Most persons have come to discount such extravagant claims heavily whenever made.

Deception through misrepresentation of facts is a far more serious form of dishonesty. It is an attempt to deliberately deceive the prospective purchaser and make him believe he is going to get something for his money which in fact he does not get. If a breeder represents that in a certain pen he has hens with certain records and mean egg weights, and if he solicits orders from an unsuspecting public for hatching eggs and baby chicks from those hens on the strength of the records claimed and published by him, and if those hens did not in actual fact make such records, then it would appear to us that the breeder is deliberately using the mails to defraud, which constitutes a Federal penitentiary offense.

We are not among those who have been clamoring for the suppression and punishment of dishonesty in poultry advertisements and catalogs. We have never advocated the singling out of a man who resorts to such methods or his public exposure or civil or criminal prosecution. It is the R.O.P. system we are endeavoring to expose, not individual breeders. In submitting specific instances of material published by certain breeders in their sales literature to critical examination, we do so not to attack individuals who have made serious mistakes but because only by citing such specific instances can we hope to convince national plan enthusiasts that the plan does not appear to have protected the purchaser against what might to some appear to be fraud, or the producer against "unscrupulous competition."

However, we do not feel that a man who engages in unfair trade practices should escape official notice and public censure because he occupies a high position, or on account of personal popularity. It would seem that the more richly one is endowed with high ability to achieve what so many can never hope to achieve, the greater one's resources, training, experience, showmanship, and skill, the less one would have need to resort to anything unfair in order to succeed. And the higher the name, the greater the public trust that is placed in it, the greater the obligation to uphold that trust.

No breeder who publishes data with regard to the performance of his birds on the strength of which he solicits orders for his products has any moral or legal ground for objecting to the material that he himself prints in his sales literature being publicly subjected to such statistical analysis as will determine whether or not it violates known mathematical or biological laws.

The plan provides for a cumbersome and expensive system of official inspection, filing records in triplicate with official State agencies, etc., but this is not what is needed to stop dishonest advertising or fraudulent misrepresentation. The statistical analysis of a breeder's own records is necessary in order to determine whether the records are true or false. If high officials of the U. S. Department of Agriculture, which is largely a regulatory organization, can assume the leadership in putting across on a national scale a plan which does not do what it professes to do, there is no doubt that these same officials could legitimately and at much less expense call to the attention of the Federal Trade Commission any apparent evidence of fraudulent advertising or dishonesty being sent out through the United States mails. It would then be a very simple matter for the Federal Trade Commission to require persons being investigated to defend themselves against such charges or suffer the consequences. This would clean up the most flagrant cases of dishonesty in a hurry, i.e., "now"! Unfortunately, it is the least spectacular approach to the problem, although by far the most effective.

The Case of Breeder A (Independent)

This breeder makes some remarkable representations in his catalog and sales literature. We herewith reproduce the records claimed by Breeder A for one of his lines:

Table No. 2

Dam 1st yr. egg record	 Mean egg weight	Daughters No.	 1st yr. egg record	 Mean egg weight	Granddaughters No.	 Average 1st. yr. egg record	 Average mean egg weight
334	25.2	1	292	25.2	12	284.8	25.2
		2	286	26.4	14	266.4	25.0
		3	259	24.0	11	279.0	26.4
		4	274	25.2	10	253.6	24.6
		5	335	24.6	14	294.8	24.8
		6	288	26.0	19	267.0	25.8
		7	309	25.2	16	276.2	25.2
		8	281	24.0	11	254.0	24.5
		9	321	24.6	10	266.5	25.0
		10	243	26.4	8	260.4	26.0
		11	296	25.6	12	260.4	24.2
		12	274	26.4	15	281.0	25.6
Totals and averages		12	288.2	25.3	152	272.6	25.2

Breeder A goes on to publish a report of "five year trap-nest records of all pullets laying 200 eggs or more which averaged to weigh 24 oz. or more per dozen":

Table No. 3	Year	Av. egg production	av. egg size
	1930-1	249	24.7 oz. per doz.
	1931-2	262	25.2 " " "
	1932-3	268	25.0 " " "
	1933-4	253	25.2 " " "
	1934-5	264	25.2 " " "

Now mean egg weights constitute objective measurements obtained by weighing numerous eggs on a precision instrument known as an egg scale. The larger the number of weighings and the larger the number of birds measured the more certain are the results obtained to conform to known mathematical and biological laws.

The mathematical odds against the egg weight distribution in Table No. 2 occurring by chance have been computed to be more than 2,000,000,000 to 1. The odds against those results plus the results published in Table No. 3 both occurring are so great as to be astronomical.

Breeder A goes on to assure his prospective customers that his birds not only lay a great many eggs that average 25.2 oz. per dozen in weight, but that they also possess very high livability. He states that the livability of an average of 2,000 pullets trap-nested per year, including "all losses for a full twelve month period each year" has been as follows:

Table No. 4	Year	% Livability
	1931-2	89.8
	1932-3	89.4
	1933-4	89.6
	1934-5	89.6
	4-year average	89.6

Now the things which determine the livability of approximately 8,000 chickens are hereditary and environmental conditions which are definitely known to vary from year to year. In fact, variation is one of the most common phenomena in nature, and the very thing which makes the breeder's work possible. In no two years are exactly similar conditions likely to occur. We know that climate varies from year to year, even in California. In no two successive years is the rainfall exactly the same, to say nothing of four. The same applies to temperature, disease conditions, nutritional factors, and caretakers, while it is also true that in no two years are the hereditary combinations producing 2,000 pullets likely to be the same. Variations tend to offset each other to some extent; errors tend to compensate themselves. One year the breeding might be enough better to offset more unfavorable environment, but the odds against such a state of equilibrium being reached between numerous factors, all of which are definitely known to vary tremendously, are very great.

Massachusetts Station Data

By way of contrast with the data published by Breeder A, we call the readers attention to the data published by the Massachusetts Experiment Station in Bulletin No. 307, April 1934, p. 6, showing the variation in mortality in the station's high-production line from year to year for the ten-year period 1923-32 inclusive:

Table No. 5	Year	No. of birds	% Mortality
	1923-4	472	26.06
	1924-5	422	50.00
	1925-6	553	22.97
	1926-7	479	32.57
	1927-8	551	23.23
	1928-9	560	14.29
	1929-30	507	33.73
	1930-1	461	29.28
	1931-2	462	17.10
	1932-3	377	35.54

Note that in none of these ten years was mortality the same. During these ten years the mortality figure did not land twice on the same digit, let alone on the same decimal point!

The Case of Breeder B (R.O.P.)

Breeder B publishes a price list each year in which he represents that he has a large number of pens each made up of a dozen or so birds with certain first-year egg records and certain mean egg weights which are set forth. Breeder B states that R.O.P. chicks from these birds "offer hatcherymen and breeders an opportunity to improve their flocks economically." From some of his pens he offers chicks at the rate of $50.00 for 12 chicks, slightly more than $4.00 per chick. He states that pedigrees are furnished, "signed and stamped by the Supervisor of the __________R.O.P. Association under the direction of the Poultry Department of the __________State College." Breeder B is not a small unknown operator just cutting his eye teeth. Indeed, Breeder B is one of the very largest operators in the entire United States. Few poultry breeding establishments make up as many individually pedigreed matings each year as does Breeder B. (648 in 1937.) There is probably no name in America which is held in higher esteem by the American poultry industry. The very publication of that name in connection with anything questionable would rock the country.

Now we do not state that the mean egg weights claimed by Breeder B could not under any circumstances be true. Even when odds are 1,000,000,000 to 1 against a thing occurring by chance, there is still that one chance. However, when the egg weights claimed by Breeder B are plotted (see chart) it at once becomes apparent that the distribution of birds in the various egg weight classes is highly abnormal. By way of contrast, we present the distribution occurring in the corresponding Kimber Poultry Breeding Farm birds.

Analyzing the distribution (method based on the work of Sheppard appearing in Biometrika Vol. 2, p. 178, 1903) we may take as a convenient starting point the section of both curves from 24.5 to 25.4 oz. per dozen. Table No. 6 presents a mathematical analysis for this portion of the curve for the birds of Breeder B and also for the Kimber birds.

Table No. 6

	"B" Birds						Kimber Birds					
Class limit	N'	N"	Std. error of N'	Diff.	Std. error of diff.	Diff. / S.E.	N'	N"	Std. error of N'	Diff.	Std. error of Diff.	Diff. / S.E.
24.45	0	239	--	--	--	--	0	143	--	--	--	--
24.55	30	209	5.12	--	--	--	14	129	3.55	--	--	--
24.65	49	190	6.24	11	8.07	1.36	26	117	4.61	2	5.72	0.35
24.75	74	165	7.15	6	9.49	0.63	33	110	5.04	5	6.83	0.73
24.85	90	149	7.49	9	10.35	0.87	53	90	5.78	13	7.66	1.70
24.95	104	135	7.66	2	10.72	0.19	66	77	5.96	7	8.30	0.84
25.05	167	72	7.09	49	10.45	4.69	80	63	5.94	1	8.41	0.12
25.15	188	51	6.33	42	9.51	4.42	93	50	5.70	1	8.23	0.12
25.25	212	27	4.89	3	8.00	0.38	106	37	5.24	0	7.74	0.
25.35	227	12	3.38	9	5.95	1.51	120	23	4.39	1	6.84	0.15
25.45	239	0	--	--	--	--	143	0	--	--	--	--

In the case of the "B" birds, the 25.0 class differs from the 24.9 class by 4.69 times the standard error of the difference. Such deviation is to be expected to occur due to chance in only one out of over 400,000 cases, or in other words, can hardly be the result of random sampling.

Breeder B does not present any mean egg weights below 24.0 ounces per dozen, and it is, therefore, not possible to make a corresponding computation for the most abnormal portion of his distribution curve. However, similar abnormalities occur in Breeder B's data in the 26.0 class and to a lesser extent in the 27.0 class. The odds against all these abnormal distributions occurring by chance in Breeder B's birds are so large as to run very definitely into astonomical figures. On the other hand, there is no significant variation between classes in the Kimber birds, especially if the entire curve be considered.

In the case of the Kimber birds, no class differs from its neighbors by more than 1.70 times the standard error of the difference, or in other words, the distribution is a chance one.

A certain amount of variation is allowable and to be expected, but once the variation exceeds certain definitely determinable limits, the odds rise at a breath-taking rate. If the difference divided by the standard error is not over 2.0, there is "borderline" significance. If the difference divided by the standard error amounts to 2.6, the odds become 100 to 1; if 3.3, 1,000 to 1; at 4.4, the odds are approximately 100,000 to 1; at 4.69, over 400,000 to 1; at 6.8, 65,000,000,000 to 1. In determining the odds against the combined abnormalities occurring in the "B" birds curve, the odds against each peak occurring are not added together but multiplied together!

We would conclude, therefore, that the distribution appearing in the "B" birds is probably not the result of chance. How, then, could it have occurred? In only one of two ways. Either Breeder B has such a large flock that he has enough birds with a mean egg weight of exactly 24.0, 25.0, 26.0, and 27.0 ounces per dozen to give him as many birds with those mean egg weights as he claims, in which case he would have far more birds on the intermediate decimal points than he reports, unless he definitely selected for birds with a mean egg weight ending in .0 in preference to birds with intermediate egg weights (which would be such a silly basis for selection as to tax one's credulity) or else his records are not accurate. Does it not seem that birds from the .8 and .9 classes have been promoted in order to have more birds in the .0 classes? The reader will have to draw his own conclusions We merely submit the evidence which Breeder B himself publishes and mails out to prospective customers in his bid for business.

The cases of Breeders A and B are not the only instances of strange claims that might be cited, but they are typical.

It should be pointed out that the complete abolition of arbitrary restrictions for the selection of foundation breeding stock would tend to remove most of the temptation to fake records. The necessity of making one's birds meet a minimum mean egg weight of 24.0 ounces per dozen unquestionably constitutes a temptation to many R.O.P. breeders to make some of their birds meet that requirement. We believe that such restrictions should be removed in the interest of encouraging honesty. At the same time no such system as R.O.P. can possibly guarantee honesty or make it legitimate for official inspectors to "vouch" for the honesty of any breeder's records as they are required to do under the present plan.

National Plan Not Necessary

The final feeble argument of those supporting the plan is that even though the plan is imperfect, it is necessary in order to improve conditions in the industry. The lower stages perhaps, but certainly not R.O.P. or R.O.M. We have endeavored to show that technically the R.O.P. and R.O.M. stages of the plan are genetically unsound, are filled with ill-advised arbitrary restrictions, and hamper the most advanced breeding work. We have also endeavored to show that the plan has not stopped objectionable practices either outside the plan or under it. We contend that more and better scientific research plus enlightened self-interest is what the industry needs, not the sort of standardization and stagnation and paternalism that the plan tends to bring about.

It is said by some that this plan is "just what the poultry industry has been looking for for more than ten years." The entire industry? Or just some of those who see in R.O.P. a chance to suppress competition? Does the industry really wish to abandon opportunity and progress and freedom, -- even if it may involve some watching, -- in favor of this R.O.P. siren that sings so sweetly while true breed improvement is swept to destruction?

The greatest good for the greatest number can only be brought about by increasing values and lowering costs in the industry,-- to the breeder, to the hatchery, to the commercial poultryman, and to the consumer. In the long run this can be done only by the most advanced methods science and industry can devise. The greatest progress comes from the freest possible opportunity for individual initiative to express itself in not one but many different ways.

Does anyone think that the aircraft industry could possibly have made the advances which it has made during the past twenty years if there had been a "National Uniform Airplane Manufacturing Plan" and that only planes produced under it had received Government approval? So far as we are aware, there is no "National Uniform Plan" for the manufacture of shoes, or rubber tires, or radios, or any one of a thousand other products in daily use.

Foolish in some respects, Uncle Sam has been wise enough to give American industry and initiative a free hand indeed when it comes to the development of industrial and technological processes, and this policy should continue, and should prevail in the poultry industry. American initiative should be encouraged, not crushed, in the poultry industry just as in all our other great industries, subject only to such necessary Governmental regulation as is basically fair.

What Does the American Poultry Industry Really Want?

Is it not time that the poultry industry be completely and forever liberated from a system which tends to give R.O.P. breeders a virtual monopoly of the business of producing pedigreed eggs and chicks for seed-stock purposes to the great injury of progressive, independent breeders and the industry itself? Let the lower stages of the plan continue if it is felt they are worth while, but should the grading up of hatchery flocks and the quality of products put into the hands of American commercial poultrymen be made to depend solely on the stereo-typed operations of R.O.P. breeders while the products of independent breeders are virtually OUTLAWED for flock-improvement purposes?

Is it not time that the American poultry industry demand that R.O.P. itself be outlawed as inimical to the best welfare of the industry? Is R.O.P. to be allowed to fasten permanently upon the American poultry industry a burden which cannot be justified on scientific, economic, or moral grounds? Is R.O.P. and its ill-advised restrictions and cumbersome hypocrisy going to be allowed to continue to grow and wax fat upon public money from the U. S. Treasury, spent freely by those who may not realize that every dollar therein was wrung from other men's toil, including the labor, physical and mental, of millions of American poultrymen? The U. S. Department of Agriculture should not be denied any money it may need for legitimate scientific research or legitimate regulatory work.

But does the American poultry industry itself want to see this thing called R.O.P. continue? Does the industry itself want to see R.O.P. continue to exploit the fair name of our scientists and educational institutions in order to put money into the pockets of R.O.P. breeders who are less concerned with developing superior values than with raking in the dollars? Does the poultry industry itself want to see R.O.P. continue to threaten the integrity o the foundation breeding establishments on which the industry must inevitably depend for the quality of its seed stock and for the development of values and the reduction of costs? Does the industry itself want to see R.O.P. continue to tempt American foundation breeders to deceive others and dishonor themselves in order to make more money?

Would it not be far better to abolish every single so-called "standard" and other prescribed breeding procedure in the higher stages of the present plan, concede frankly that dishonest advertising is the big issue, not proper breeding procedure which is still in a state of flux, let breeders stand or fall on the performance of their products in the hands of their customers but insist that they tell the truth in their sales literature as to what they have to offer and what they do to try to make their products good?

REPORT ON ISSUES RAISED IN THE ARTICLE ENTITLED "R.O.P. OR PROGRESS".

Although the paper "R.O.P. or Progress" was not provided for on the conference program, at the request of Mr. Kimber to the Government officials who were present, the entire manuscript was read before all those in attendance at the conference.

After a general discussion of the paper, a motion was offered and carried unanimously that the conference appoint a committee to consider the manuscript and prepare a statement in reply to Mr. Kimber, to be sent to him by the proper Government official. This committee was nominated from the floor and duly appointed. It consisted of M. A. Jull, chairman, James E. Rice, E. B. Parmenter, G. S. Vickers, L. C. Beall, C. N. Whittaker, C. W. Knox, and T. C. Byerly. This committee prepared a report which was adopted by the conference, and an exact copy of it follows.

The National Poultry Improvement Plan in its breeding and pullorum-control stages is a voluntary plan developed by and for flock owners, hatcherymen, and poultry breeders, and is designed to be in the best interests of the buyers of hatching eggs, baby chicks, and breeding stock. The poultry industry had felt the need for such a plan for more than a decade. At the end of this period, 1935, a carefully thought-out and workable plan was placed before the U. S. Department of Agriculture by the poultry industry and aid requested for coordinating and administering this plan. The U. S. Department of Agriculture agreed to do this and put it into effect on a voluntary basis July 1935. It is voluntary for the State to participate in this plan and it is voluntary for the hatcherymen and poultry breeders to cooperate with the State.

The U. S. Department of Agriculture has arranged for a conference each year with delegates from participating States for the purpose of acting upon constructive suggested changes to the plan. Previous to such annual conference there is ample opportunity for flock owners, hatcherymen, and poultry breeders to confer with the proper State authorities concerning suggested changes. Thus each year the plan may be changed by majority rule to meet changing conditions and to make the plan more nearly perfect.

Some problems of major importance have been raised regarding certain features pertaining to the R.O.P. and R.O.M. stages of the plan. In order to clarify certain misconceptions and correct misstatements of fact made with respect to these features, the following explanations are made:

The breeding stages of the plan make no attempt to standardize breeding procedure, which is understood to mean a method of breeding, such as linebreeding, inbreeding, or outbreeding. The plan merely requires that certain minimum requirements of performance and characteristics must be met by individual birds in order to qualify for recognition. Many of our leading and most experienced breeders of poultry have cooperated in the national plan and have found that there are no restrictions in regard to their own particular breeding methods.

With respect to the statement made that breeders cooperating in the R.O.P. stage use highly selected samples only, it may be stated:

First: That this is not true for all R.O.P. breeders;

Second: That with many R.O.P. breeders, the selection of the best pullets for entry as U.S.R.O.P. candidates is an economic necessity; and

Third: That many breeders operating under the plan, trapnest all of the pullets of all families, whereas others make their selections on a family basis, trap-nesting the members of the entire family. This practice largely eliminates the objections raised in respect to the absence of a random sample.

Concerning the contention of the destruction of a random sample because of undue culling, it is stated that there is no requirement in the plan that any R.O.P. candidate be removed before the completion of her first year record. Some States, however, in their own State plans, require the culling of pullets with standard disqualifications. Such disqualifications have not been shown to bear any relation to production characters. Furthermore, the elimination of such birds would have little or no effect upon the measurement of family viability.

The minimum requirements of 200 eggs, averaging 24 ounces to the dozen, and standard body weight are deemed necessary by the majority of R.O.P. breeders and in their opinion candidates that fail to meet any one of the minimum requirements of the plan should be eliminated from the R.O.P. and R.O.M. matings to prevent possible abuses. Segregation of such deficient candidates or their improper mating might easily lead to the sale of chicks not meeting at least the minimum requirements and thus destroy confidence in the value of identified superior stock. It might be desirable for a breeder to use such birds in his own breeding program but the public would not be protected.

Although there is no direct statement in the plan that there are viability requirements, nevertheless indirectly this is taken into account in the R.O.M. stage by the provisions for the minimum number and percentage of daughters required to qualify. High mortality would preclude the qualification of the required number and percentage.

In a report of a private test in a non-participating State comparing the stock of three R.O.P. breeders with two non-R.O.P. breeders to the detriment of the former, it may be stated that the mortality was very excessive, so much so that the production records are of little value. Furthermore, chicks obtained from R.O.P. breeders in other States may not have had a proper acclimation to California conditions, especially with respect to disease. It is well established that birds from unexposed flocks, with respect to a particular disease, may contain many susceptible birds. Last, but not least, it certainly is true that the stock from hundreds of U.S.R.O.P. breeders should not be tried, tested, judged, and sentenced on the results obtained from the stock of any three R.O.P. breeders in a single test conducted by only one individual.

The R.O.P. breeder, generally, and those in this work for a period of years, feel that the increased cost of production is more than compensated for by the increased values or increased demand for their stock. While any one non-participating breeder may have developed stock superior to that developed by the average cooperating R.O.P. breeder, laying contest results demonstrate that records made by R.O.P. breeders over a period of years are higher, on the average, than those made by non-participating breeders.

Advertising claims are and will be better controlled under the plan than without it, especially with respect to statements such as 300 egg strain "and the like". It is the duty of officials in the plan to carefully examine advertising material written by their members and to have objectionable statements removed.

Any apparent violations of Federal fair trade practice regulations are more likely to be brought to the attention of the Federal Trade Commission by official State agencies than by individuals.

Violation of the regulations of the N.P.I.P. should be brought to the attention of the official State agency and the U. S. Department of Agriculture, both of whom are under obligation to correct the situation.

A large number of poultrymen, hatcherymen, and poultry breeders in 41 States apparently believe the plan is of sufficient importance and value to justify its existence and the number of States and individuals participating in the plan is steadily increasing.

The following resolution was passed unanimously by all those in attendance at the conference:

> Resolved that the delegates and industry representatives present at this conference express their appreciation of the open-minded and fair attitude displayed by the Department officials in permitting presentation and discussion of the paper by Mr. John E. Kimber.

. . .

REPORT OF THE COMMITTEE ON RECORD FORMS

By J. W. Kalkus, superintendent, Western Washington Experiment Station, and supervisor, Washington Poultry Improvement Association, Puyallup, Wash.

At the conference last year Mr. Zumbro, in his paper on "Simplicity and Uniformity of Records" used in various stages of the National Poultry Improvement Plan, discussed in a very comprehensive manner the various types of forms needed. He also selected a few examples of forms used by various States which he thought would meet most adequately the requirements of the plan and pointed out their advantageous features. He did not at that time attempt to recommend any special forms, contracts, agreements, certificates, labels, etc., for adoption but stated that it was his belief that it would be desirable gradually to develop a uniform system of record forms which might be used by all States desiring to participate in the plan.

In order to develop and put into operation such a system the committee on record forms was selected at last year's conference. It was the hope at that time that this committee would be able to get together, make a study of the forms used by various States, in the administration of the National Poultry Improvement Plan and start to develop a complete set of forms which the official State agencies engaged in the work of the plan might use if they desired, and recommend for adoption at least a few record forms which were needed immediately for proper compliance with the rules of the Plan. However, owing to the fact that the time was so thoroughly occupied with the conference itself, it was impossible for the committee to meet for a sufficient length of time to accomplish this.

The committee held one brief meeting at the conference last year at which time there was only a general discussion regarding the function of the committee and its future plan for attempting to develop, as nearly as it is possible to do so, a simple and uniform system of record keeping. All of the members of the committee agreed that simplicity and uniformity in record forms was desirable but some expressed the doubt that it would ever be possible to develop a full set of identical forms that could be used by all States, because of the different types of agencies under which the plan is being administered and because many of the States had already developed a system of record keeping which they considered entirely satisfactory. It was generally agreed, however, that it would be possible to develop some of the required forms in such a way that they could be used satisfactorily in all States. That this could be done seems to have been demonstrated by the satisfactory use in several States of the few forms that the committee has developed and made available during the past year.

Since it was impossible for the committee to find time to develop a uniform method of records at last year's conference, it was decided to leave that matter, at least for the time being, in the hands of Mr. Winton and Mr. Zumbro. These men had already made a fairly complete collection of all the available forms used by various States participating in the plan, and they had also devoted considerable time to the study of these forms, and were, therefore, in a better position than the other members of the committee, to make recommendations for adoption of such forms as they felt were needed at once. They gladly assumed this responsibility, and it was agreed that they should, as soon as possible, send each member of the committee a complete set of forms for their study and consideration. It was, of course, hoped that at least some of the more important forms could be developed within the following few weeks and submitted to all members of the committee for consideration and study in advance of a meeting of the committee which was scheduled for July during the meeting of the International Baby Chick Association in Kansas City. It was also suggested that it would be a good plan to make arrangements for the committee to meet two or three days in advance of the next national conference, in the event that such a conference was to be called.

Early in July the committee members received a letter from Mr. Winton advising that they had been unable to look over all the record forms that were collected at the conference in Chicago, and that in all likelihood they would be unable to get a copy of the representative forms to the balance of the committee before the meeting of the International Baby Chick Association in Kansas City. This letter was accompanied with quite a large file of forms used by various States, with the request that they be looked over and suggestions made for consideration by the committee at its Kansas City meeting. It must have become evident to members of the committee in looking over these forms that they had assumed a rather formidable task when they accepted appointment on the record forms committee for the purpose of attempting to develop a set of uniform record forms.

Necessarily the progress in the development of suggested forms for use in administering the national plan is slow. But even after the forms are developed a considerable amount of delay is occasioned by the fact that members of the committee are located in widely separate places and some of them are away from their offices a good share of the time doing field work. Furthermore, it is not always possible, even in the case of a small committee, to discuss matters through correspondence in such a way as to make them entirely clear without the exchange of several letters. Hence in many cases there is bound to be undue delay before all members of a committee are in complete agreement.

All members of the committee with the exception of Roy E. Jones and the chairman, met on July 22, in Kansas City. Mr. Zumbro presented a classified list of the forms used by official State agencies in the administration of the plan and another list indicating the information called for on each kind of form. Representative samples of the forms used by the various States were then examined. After due consideration and study, two forms were definitely agreed upon and recommended for adoption. These two are a Hatchery Agreement and a Flock-Selecting and Pullorum-Testing Report. These were subsequently mimeographed and sent out by the Washington office to all State agencies. A third form recommended provides for an annual report on all birds entered in R.O.P. This was subsequently printed, designated as A.H. Form 468, U. S. R.O.P. Pullet Report and A.H. Form 469, U.S. R.O.P. Hen Report and sent to all States cooperating in the R.O.P. stage of the plan.

The committee also expressed a desire to have a National Poultry Improvement Plan emblem, which could be used on labels, certificates, letterheads, etc., and they asked for the cooperation of the Bureau of Animal Industry to develop such an emblem. In compliance with this request, the Bureau subsequently developed such an emblem, which has been furnished free of charge to all State agencies for distribution to their members.

In a letter addressed to the chairman of the committee under date of August 20, 1936, Mr. Winton stressed the importance of giving immediate consideration to two additional report forms: First, one which will provide for the R.O.P. breeder to report on the pen and dam number of each R.O.P. egg, chick, or male sold, and the egg production and average egg weight and body weight of each dam, since a part of this information is called for in paragraph 1 on page 6 in the plan, second, an R.O.P. incubation and wing-banding report which will provide for reporting on R.O.P. eggs incubated, the total number of good chicks hatched and banded, and the wing-band number used. Mr. Zumbro prepared tentative drafts of these two forms and had an opportunity to discuss them with officials of various States while on his tour of inspection in October and

November, 1936. These were put into final form while Mr. Zumbro was in the State of Washington, and on November 5, copies were sent to all members of the committee for suggested changes or approval. It was our hope, of course, that it would be possible to have these forms approved by all members of the committee promptly and that arrangements could be made to have them printed at some central point for distribution and sale to all States participating in the plan before the beginning of the hatching season. Unfortunately, for various reasons, final replies were not received from all members of the committee until a month later.

On the whole, the forms, with a few modifications, were approved by the committee, and Mr. M. A. Seaton of Kansas was kind enough to secure bids on printing and distribution. However, the bid secured was on a minimum of 50,000 sets which would have been far in excess of the requirements of all States, and these did not reach the chairman's office until almost the middle of January. This made it too late to send out for additional bids in smaller lots, and, therefore, the chairman took the responsibility of having the printing done in the State of Washington, and the forms were offered for sale to other States at approximately cost. During the past season 1,128 sets of Incubation and Chick Banding Reports, and 118 pads of R.O.P. Sales Reports were furnished to 12 State agencies for use. The following record forms have been developed during the past year by the committee:

1 - Hatchery Agreement
2 - Flock Selecting and Pullorum Testing Report
3 - U.S. R.O.P. Pullet Report, A.H. Form 468
4 - U.S. R.O.P. Hen Report, A.H. Form 469
5 - U.S. R.O.P. Sales Report
6 - U.S. R.O.P. Incubation and Chick Banding Report

This year arrangements were made to have the committee meet in advance of the conference and with the valuable help of Mr. Beall, it worked in almost continuous session during Friday, Saturday, and Sunday of last week. Some of the forms named above which have been in use have been altered slightly and others have been developed and added to the list, making a total of 13, as follows:

1. Hatchery Agreement. This is a required agreement form or contract between the official State agency and the hatchery which is to be executed in duplicate, one copy for each contracting party.

2. Flock Agreement. This form is to be used as an agreement or contract between the official State agency and the flock owner in the event that the latter sells products produced under the operation of the plan directly to poultrymen. In the event that the flock owner is a member of a hatchery or furnishes eggs to a hatchery which is responsible for the payment of his fees to the official State Agency, the form need not be used. The form has been prepared in a manner that makes it suitable for use for Approved, Verified, Certified, or R.O.P. flocks, and flocks of all pullorum-control classes. It is to be made in duplicate, a copy going to each contracting party.

3. Flock Selecting and Pullorum Testing Report. This form is suitable for keeping a record of flock selecting and pullorum testing. Although not required under the plan, space has been provided for recording grade classifi-

cation of flocks by hatchery if chicks are sold by grade. It is to be made in quadruplicate, a copy for the official State agency, the official inspector, or flock-selecting or pullorum-testing agent, the flock owner and the hatchery.

4. Flock Inspection Report. This form is for the use of the official State inspector in making regular inspections of all except R.O.P. flocks. It is to be made in duplicate, one copy to be retained by the inspector and one sent to the official State agency.

5. Hatchery Inspection Report. This form is for the purpose of reporting routine inspections of hatcheries. It is to be made in duplicate, one copy to be retained by the official State inspector, and one sent to the official State agency.

6. U.S. R.O.P. Inspection Report. Space is provided on this form to record number of eggs laid by the flock on the day or days trap-nesting is done by the official inspector. Space is also provided for making a record of eggs laid during a ten-day period prior to the inspector's visit for comparison. It is also to be used in checking on R.O.P. breeding pens during the breeding season. The report is to be made in duplicate, one to be sent to the official State agency, and the other retained by the inspector.

7. U.S. R.O.P. Breeding Pen Record. This form has been made as simple as possible in order to provide for the minimum amount of information called for in the plan. It is to serve as a record of R.O.P. matings to be filed in the office of the official State agency.

8. U.S. R.O.P. Incubation and Chick Banding Report. This form offers a means of keeping complete, simple, and adequate records of incubation and chick banding of pedigreed chicks for both the breeder and the official State agency. It has been used successfully and with evident satisfaction by R.O.P. breeders in nine States during the past hatching season.

9. U.S. R.O.P. Pedigree Index Record. This form is needed where pedigreed chicks are wing banded with serial numbers that do not include dams' and sires' identification numbers. It provides a means of readily identifying the pen number, dams' number and dams' record by listing serial chick-band numbers in numerical order. Provision is made on this form for keeping a record of comb inspections where R.O.P. males are to be dubbed before they are six months of ag

10. U.S. R.O.P. Sales Report. This form is necessary for making reports to the official State agency of the sale of R.O.P. products by the breeder. In the cas of intrastate sales it is made in triplicate, one copy for the purchaser, one for the official agency, and one to be retained by the breeder. In the case of interstate shipments, an additional copy is made and mailed after approval by the official agency in the State of origin to the official agency of the State to which the products are shipped. This form is now being used by R.O.P. breeders in eight States. In addition to being a record of sales this form provides a means of checking easily on males sold to head Certified flocks. Some R.O.P. breeders also consider it of some value as an advertising medium in giving publicity to the plan, especially where breeding stock is sold to hatcheries not now operating under the plan.

11. U.S. R.O.P. Male Record. This form provides for making a complete record of all R.O.P. males when they are leg banded by the official State inspector

after they are six months of age. It may also be used in case the males are to be dubbed before they are six months old. The form is to be made in duplicate, one for the inspector and one for the official State agency.

12. U.S. R.O.P. Pullet Report, A.H. Form 468 and U.S. R.O.P. Hen Report, A.H. 469. Those forms are to be used in duplicate as a field work sheet in making final qualifying inspection of R.O.P. females. Entry band numbers, sire's band number, dam's number and dam's egg production, may be recorded in pencil during available time. Entries of disposal may be made by the inspector during official trap-nest visits. After completion of the R.O.P. year, entry of egg production, egg weight and body weight, is to be made prior to final qualifying inspection. At time of final inspection the permanent R.O.P. leg-band number, if one is used, is to be recorded. This completed information is then to be transferred onto a like form in triplicate for permanent record, one copy for the flock owner, one for the official State agency, and one for the Bureau of Animal Industry.

13. U.S. R.O.P. Breeding Pen Progeny Record. This form is intended for the purpose of identification of U.S. R.O.P. males and females that are candidates for U.S. R.O.M. qualification.

Labels. The committee recommends that all labels include space for the name of the breeder or hatchery, and name and address of purchaser. It should also include the outline of the State, the name of the supervising official State agency, breeding stage, pullorum-control class and the National Poultry Improvement Plan emblem. The committee further recommends that when new labels are printed, a purple color be used to indicate U.S. R.O.P. and/or U.S. Pullorum-Clean; blue for U.S. Certified and/or U.S. Pullorum-Passed; red for U.S. Verified and/or U.S. Pullorum-Tested; and yellow for U.S. Approved; these colors to be used separately or in combination as the participation may require.

All completed forms will be mimeographed by the Bureau of Animal Industry and copies will be sent to all official State agencies with a request that orders be placed with the Bureau on number of each desired in the event that arrangements can be made to have printing and distribution done by some designated commercial printing firm.

J. W. Kalkus, chairman
R. B. Jones
Roy E. Jones
J. M. Moore
M. A. Seaton

REPORT OF THE TURKEY IMPROVEMENT COMMITTEE

By J. H. Martin, professor and in charge of
poultry husbandry, University of Kentucky, Lexington, Ky.

At the National Poultry Improvement Conference held in Chicago in May 1936 delegates from several States indicated that there was an interest among their turkey breeders in the possible application of the national plan to turkeys. It was reported that in several

States particularly Wisconsin, North Dakota, Kansas, Michigan, and Kentucky the turkey breeders had been offered the opportunity to develop an improvement program under State guidance. These programs as well as other plans were all of an unofficial nature.

In order to determine whether the turkey industry could be aided with the application of the principles of the national plan to turkeys, and to formulate and propose such a plan, a committee was appointed at the 1936 conference, after the adoption of a motion from the floor empowering the chairman to appoint a turkey committee. The committee which is representative of every section of the country consists of the following men, most of whom were in attendance at the 1936 conference.

J. H. Martin, Col. of Agr., Lexington, Ky.
D. H. Reid, Texas A. & M. Col., College Station, Texas
Carl Frischknecht, Utah Agr. Col., Logan, Utah
Frank Knowlton, Ore. St. Agr. Col., Corvallis,Ore.
Frank Moore, N. Dak. Agr. Col., Fargo, N. Dak.
Howard C. King, Dept. of Agr., Madison, Wis.
Wade H. Rice, Agr. Ext. Service, College Park,Md.
Roy E. Jones, Agr. Ext. Service, Storrs, Conn.
M. A. Seaton, Agr. Ext. Service, Manhattan, Kans.
Ex Officio
S. J. Marsden, Bureau of Animal Industry, U.S.D.A., Washington, D.C.
H. L. Shrader, Agr. Ext. Service, U.S.D.A., Washington, D.C.

The committee was appointed at the close of the conference and hence had an opportunity to have only one informal meeting. It was agreed that a good share of the work would have to be followed up through correspondence and that each member would contact the members of the turkey industry in his State, particularly the breeders and producers, to get their reaction on the program as it developed.

On July 15 the members of the committee were notified that there would be a meeting of the committee during the Poultry Science Association meeting at Blacksburg, Va., August 5. All members were instructed to send the chairman their suggestions on a tentative program or to be present in person. At the committee meeting at Blacksburg the following committee members were present: D. H. Reid, Wade H. Rice, Roy E. Jones, S. J. Marsden, H. L. Shrader and J. H. Martin, with Berley Winton ex officio. As a result of this committee meeting a tentative program was drawn up and on August 14 sent to all the members of the committee. This tentative program took cognizance of the various suggestions from committee members who were unable to attend the meeting. It was realized that all the suggestions could not be incorporated but each suggestion was weighed and given careful consideration before its inclusion or omission.

The tentative program brought several constructive suggestions and in September 1936 it was decided by the chairman with the approval of several members of the committee that perhaps the most good could be done by publishing the results of the committee's work to date. Hence, the tentative program was published in the October 1936 Turkey World and November 1936 U. S. Poultry & Egg Magazine. Copies were also sent to other journals, including the American Turkey Journal, for publication if they saw fit. In each publication of the proposed plan the tentative nature was emphasized and constructive suggestions and criticisms requested. Attention was called to the fact that the committe was made up almost solely of scientific workers and contained no turkey breeders. It was thought that publication of a tentative plan in the aforesaid journals would take the matter direct to the turkey breeders for their consideration and criticisms. As a result of the publication of the tentative plan the committee received several helpful suggestions for corrections and additions. These suggestions were given consideration by a sub-committee consisting of Shrader, Marsden, Rice, Martin, and Zumbro, ex officio, which met during the State Turkey Show held at Lexington, Ky. November 18 and 19, 1936.

The above sub-committee took advantage of the opportunity afforded it at this time to judge live birds which were then slaughtered for study and comparison. In the light of these studies and after considering the suggestions that had come to the committee, the sub-committee agreed on certain additions and corrections which were mailed to the heads of the poultry departments of each of the 48 States on December 7, 1936. These additions and corrections were also published in the January 1937 Turkey World which gave the entire Tentative National Turkey Improvement Plan including the latest corrections and additions. This tentative plan as published on pages 40 and 105 of the January 1937 Turkey World was recommended to the Department of Agriculture by the committee in January 1937 as a basis for procedure. The Department has since January held several meetings to discuss and re-work the plan and at each of these meetings the committee has been represented by Rice, Shrader, and Marsden. As a result of these conferences the Department has developed a "Tentative Turkey Improvement Plan" issued May 10, 1937, which may now be given consideration at this conference if the official delegates so desire.

The chief criticism that might be raised in the development of this tentative plan is that the turkey breeders have not been actively represented on the committee. This criticism may be partially offset when it is considered that each member of the committee was in close touch with the turkey breeders in his own State and section and that in practically every case he counseled and advised with a number of them before making his recommendations. In addition to this the turkey breeders were invited through the press to make recommendations to any member of the committee. In other words, there has been no disposition to ignore but on the other hand, to give every consideration to the turkey breeders and other members of the industry.

Those of us in attendance at this conference realize the many pitfalls that may arise if those States desiring turkey improvement work develop their programs independently. In order to avoid the costly mistakes of conflicting terminology and other confusing plans and details it is hoped that a plan uniform in its basis and approach of the problem can be developed and adopted by the industry.

Far be it from the committee to claim that this program is all that could be hoped for or desired. However, the committee does feel that this program represents the combined judgment, study, and experience of a group that has none other than the best interests of the turkey industry at heart.

As such it should afford a point of departure for the development and future adoption of turkey improvement as an integral part of the National Poultry Improvement Plan. Whether this conference should adopt this proposed plan or any plan is a matter for you to decide. As I see the matter there are three chief alternatives: -

(1) Take no action on turkey improvement work.

(2) Approve the general idea of adding turkeys to the national plan, but defer action on any particular plan until this proposed plan can be used as a basis for work in several States and then adopt it in modified form at some subsequent conference.

(3) Adopt this proposed plan with such changes and modifications as you, the official delegates may care to make.

The advantages and disadvantages of each of these alternatives should be thoroughly discussed and carefully weighed before final action is taken.

We, the members of the committee, assume that this presentation constitutes the final action of this committee.

THE PULLORUM-CONTROL PROGRAM IN NEW HAMPSHIRE

By C. L. Martin, assistant professor of veterinary
science, University of New Hampshire, Durham, N. H.

The pullorum-control program in New Hampshire dates back to 1918, when the late Prof. A. W. Richardson, then head of the Poultry Department at the University of New Hampshire, visited the poultry farms himself, and collected blood for the tube agglutination blood test. Naturally, the testing started in a very small way. Professor Richardson was thoroughly convinced that the eradication of pullorum disease, then called bacillary white diarrhea, from New Hampshire flocks would produce more benefits than any other one thing that could be done for the poultrymen of the State.

It required infinite patience, time, forethought and money to get the poultrymen to accept such a program. It was not easy to eradicate a disease where such eradication demanded the slaughter of the infected animals. At first only a very few flocks were tested. Records were kept of the mortality of chicks hatched from these flocks before and after testing for pullorum disease. Cases showed chick losses from 50 to 60 percent before testing that dropped to 8 percent mortality after only one year of testing. This proved good publicity and was used by the poultry department, experiment station, and extension service to interest other poultrymen in the test. Whoever accepted the testing program was compensated by the same convincing results.

In 1925 a sufficient number of poultrymen had become interested in testing their flocks to make it necessary to establish a separate laboratory in the experiment station for the express purpose of testing samples for pullorum disease.

Chicks which were sold from pullorum-free stock soon created a reputation for themselves by showing a very high degree of livability. The demands for pullorum-free chicks became greater and greater, and poultrymen had to eradicate the disease from their flocks in order to sell their chicks.

This eradication was accomplished in different ways. Some poultrymen practiced frequent testing of all their birds, removing the reactors each time until the flocks had become free from the disease. Others sold their stock, cleaned up the premises and bought replacements in the form of either hatching eggs or chicks, from pullorum-free stock.

Very early in the work, the names of the owners of flocks which were pullorum-free were published by the experiment station. This was done to authenticate the status of such flocks, to stimulate interest in the work, and to assist the buyer in the purchase of pullorum-free stock. Such a list has been issued periodically each year throughout the testing period. At first it was called the "accredited list," and contained only the names of those flock owners whose flocks had passed at least two clean tests. Later another list was issued in conjunction with the accredited list, and was known as the 100 percent free list. This gave recognition to those flocks which had passed at least one 100 percent test without reactors

We had certain regulations during these early years of our testing program. If the chickens or hatching eggs were obtained from an accredited flock it was advised that all the pullets to be used for breeding purposes be tested two months after they had achieved 30 percent production. It was required that 60 percent of their breeding birds be retested after June 1 of the following summer. If these two tested showed a freedom from the disease, the flock owner's name was placed upon the accredited list. When the birds were purchased from a source other than an accredited flock, two years of such procedure was necessary for accreditation. After a flock was accredited it was necessary that 20 percent of all the breeding birds be tested as hens between June 1 and October 1, or 100 percent of the breeding birds, both hens and pullets, before the breeding season, annually.

In 1928 the regulations were revised so that the 20 percent retesting requirement for old hens was changed to 100 percent. In 1929 the testing became official, when the Division of Animal Industry of the New Hampshire State Department of Agriculture entered into an agreement with the New Hampshire Agricultural Experiment Station, whereby the State Department became responsible for the regulatory work, the issuance of the accredited and 100 percent free lists the issuance of certificates, and the consideration of complaints regarding false or misleading advertising. The experiment station in its part of the agreement, collected the blood samples, tested the blood by standard approved methods, and reported the results to the State Department of Agriculture.

In 1935, another change was made. The State Department of Agriculture took over the collection of the blood samples, charging the poultryman three cents per sample, payable at the time the blood is drawn. The experiment station does the testing of the sample and is paid on a cost basis by the State Department of Agriculture. This has enabled the poultryman to have his testing done for three cents per sample instead of seven.

Our present listing conforms to the standards set up by the National Poultry Improvement Plan, but includes only the Pullorum-Clean and Pullorum-Passed grades. We feel that no recognition should be given to a flock until it has at least satisfied the requirements of the Pullorum-Passed status. Any grade lower admits an infected flock and no recognition should be given to an infected flock.

Let us now discuss the laboratory procedure which New Hampshire follows in testing its flocks for the presence of Pullorum disease.

The blood samples are collected in the field by men regularly employed by the State Department of Agriculture. The samples are either brought or sent by express to the testing laboratory before they are 24 hours old. After arrival at the laboratory the samples are tested as soon as possible by the standard tube agglutination method. The antigen, or testing fluid used, is standardized by a committee appointed by the Northeastern Pullorum Conference which enables these laboratories represented in the conference to give uniform interpretations of the test. This has eliminated the controversy which usually arises when duplicate blood samples are sent to different laboratories and varying results are obtained. In fact, the laboratories of this conference have an agreement not to test samples sent in from another State unless permission to test is obtained from the laboratory in that State.

At first a dilution of 1 to 50 was used in making the test and the samples were incubated at 37° C for 48 hours. Later it was deemed advisable to use a dilution of 1 to 25 and incubate for 24 hours. The lower dilution will detect recently infected birds sooner than the higher dilution. This makes it possible to clean up a flock of birds more quickly.

All samples are read by means of a special reading lamp and by the same person, which gives uniform results throughout the testing year.

When reactions are found, the numbers of these birds giving the reactions are easily procured from their blood-sample tubes. In the cases where only a few reacting birds are detected, a representative number of the stronger reacting ones are called in to the laboratory. The remaining reacting birds, if there are any, are held in quarantine. An autopsy is performed upon the reacting birds sent in, and cultures are taken from the heart, lungs, liver, and ova. These cultures are incubated and if colonies appear which are characteristic of S. pullorum, the organism responsible for this disease, they are transferred to sugars for the final diagnosis. S. pullorum gives an acid and gas reaction in dextrose and mannitol but no reaction in maltose, lactose, sucrose, and dulcitol.

When such a procedure results in the isolation of S. pullorum from a reacting bird, such a bird is classified as a definite reactor, and that flock from which it has come, as infected. Sometimes S. pullorum is not isolated, and if not, other reacting birds may be called in from the ones held in quarantine. A similar examination is made, and if results are still negative the flock owner is instructed to dispose of the remaining reactors for meat, and his flock is considered to have no infection.

In cases where large numbers of strongly positive reactors are found it is not necessary to perform this special laboratory examination, but instead the flock is immediately classified as an infected one.

One of the strongest features contributing to the success of our testing program, is the fact that, before a flock is classified as infected, even though the test shows reactors, the pullorum organism must be isolated from such reacting birds, and definitely identified as S. pullorum. If this is not done, a very grave injustice is inflicted upon the flock in question and also upon the test.

We have four flocks in which we have found reactors to the test for three different years, but not in successive years, others, less frequently, but in these instances we were unable to isolate S. pullorum and in only one case has trouble been found in the young stock coming from these birds. In this case two reactors were examined and the organism was not found. The flock was considered to be noninfected, but the following fall there were 22 reactors found in his flock of 570 birds, and the organism was isolated. This flock was disposed of and replaced by baby chicks purchased from clean sources. This flock has remained clean for six successive years since this outbreak. It is necessary then that all States doing pullorum testing must have an approved laboratory, for the purpose of isolating S. pullorum from reacting birds.

The results of all the laboratory tests are sent to the New Hampshire State Department of Agriculture which in turn, classifies the flocks into the N. H.-U. S. "Pullorum Clean" and N. H.-U. S. "Pullorum Passed" grades, in conformity with the National Poultry Improvement Plan. They also publish the names of the flock owners, together with the number and breed of birds tested.

In infected flocks, we generally recommend that the owner sell his stock, clean up the premises and purchase replacements from pullorum-clean sources. Unless the flock is of special breeding importance it is deemed too expensive to clean up the flock through the medium of frequent retests. Our records show that it takes from one to nine monthly retests to accomplish the desired results. If it is impossible to secure stock of equal breeding value, we have found it advisable to retest, at monthly intervals, the birds in the breeding pens, until they have passed two nonreacting tests and hatch the next year's stock from these birds. Before housing these pullets, all the old birds are disposed of and the premises cleaned. Usually, these pullets will be noninfected. This plan is cheaper for the owner, and he also keeps his own strain of birds.

Records of the early testing are not too complete. The first year, 1918-19, there were 4,000 samples tested. This past season, 18 years later, there were 549,482 samples tested. The earliest complete records show that in 1925-26 there were 123 flocks tested, representing 35,237 tests; 43 of these flocks were infected; 2.5 percent of the samples reacted. This past year there were 442 flocks tested, 38 of which were infected, and of the total samples, (549,482) thirty-six hundredths of one percent reacted.

At the present time we have 90 pullorum-clean flocks, representing 140,496 birds, and 308 pullorum-passed flocks, representing 344,372 birds.

To combat pullorum successfully, then, it is necessary that all measures be directed toward the eradication of the disease. The work should be under the supervision of the Bureau of Animal Industry of each State, or a similar department in order to give it its official rating, and to see that the work is done correctly. The testing should all be done by trained men in conjunction with a competent official laboratory. New Hampshire has followed such recommendations to acquire its success in eradicating and controlling pullorum. What New Hampshire has accomplished, the other States can also achieve.

MAINTAINING PULLORUM-CLEAN* AND PULLORUM-PASSED** FLOCKS

By C. A. Bottorff, C. L. Martin, T. B. Charles, New Hampshire
Agricultural Experiment Station, Durham, N. H.

The eradication of pullorum disease in many sections of the United States is being carried on by various agencies in many different ways. Obviously the results are varied. In many cases the testing agency is using the whole-blood antigen method based on comparative results they or other workers in the field, have secured. The biggest factor influencing the method used is the testing cost.

However, the typical history of many of these programs is the inability to maintain pullorum-clean or pullorum-passed flocks once a few have been secured. Because a poultryman cannot easily maintain a clean flock or even secure one, he loses faith in the test and wants to know why he should spend his time and money when he cannot keep his flock clean anyway.

The program for the eradication of pullorum and the maintenance of officially pullorum-clean and pullorum-passed flocks can never be successful with the use of the agglutination test alone. The test should be supplemented by a post-mortem and bacteriological examination for the diagnosis of pullorum. Such an examination should be made in flocks where only _suspicious_ reacting birds are found or where positive reacting birds are found in pullorum-clean or pullorum-passed flocks. If _S. pullorum_ cannot be isolated from the birds autopsied, the flock is classed as negative and the official status is given the flock.

This procedure has been justified in New Hampshire by the fact that the poultrymen have continued to test more flocks and larger numbers of birds each year. Without such a procedure they would not have had the faith in the test that they have today. It is only when we recognize the limitations of a test and accept those limitations that we can hope to make the most use of them. This is based on the fact that the birds may harbor other Salmonella infections or closely related organisms to _S. pullorum_ that produce a partial cross-agglutination and still at the same time are not infectious or pathogenic to poultry.

Since 1925-1926, the percent of reacting flocks has dropped from 35 percent to 8 percent and the percent of reacting birds from 3 percent to 36/100 of 1 percent of 549,482 samples tested during the past 1936-1937 season.

In cases of a few suspicious reacting birds in a new flock or a very limited number of suspicious and positive reacting birds in a pullorum-clean or pullorum-passed flock, a representative number of the strongest reacting birds are called in for a retest, post-mortem and bacteriological examination.

The weaker reacting birds are held in quarantine until after the examination of the other birds and are then either sold for slaughter or examined in order to secure further information on the flock. When S. pullorum cannot be isolated from the birds, that flock is classed as negative and an official status given it by the New Hampshire Department of Agriculture.

The standard tube agglutination test is the only test recognized by the New Hampshire Department of Agriculture for official rating and is the only official test ever used in New Hampshire. All routine tests conducted up to July 1, 1930, were in a dilution of 1-50 and incubated for 48 hours. Since July 1, 1930, a dilution of 1-25 for 24 hours of incubation has been used. A larger number of suspicious and nonspecific reactors are apt to occur in this dilution of 1-25, but infection can be detected earlier and cleaned up more quickly.

A study of the results obtained from making a post-mortem examination of reacting birds in order to determine the official status of a flock since 1929-1930 season shows that unless the procedure given above is used, many flocks would be classed as infected. Tables 1 and 2 give a summary of the number of birds autopsied and examined, which gave a suspicious reaction in a newly tested flock and a suspicious or positive reaction in a pullorum-clean or a pullorum-passed flock.

Table 1 - Suspicious and positive reacting birds autopsied

Year	No. of birds autopsied	No. of birds negative	No. of birds positive	Percent of birds negative	Percent of birds positive
1929-30	41	19	22	46.4	53.6
1930-31	29	13	16	44.9	55.1
1931-32	60	45	15	75.0	25.0
1932-33	65	44	21	67.7	32.3
1933-34	19	17	2	89.5	10.5
1934-35	27	21	6	77.8	22.2
1935-36	75	63	12	84.0	16.0
1936-37	176	142	34	80.7	19.3

Table 2 - Flocks having suspicious or positive reacting birds autopsied

Year	No. of flocks	No. of flocks classed neg.	No. of flocks classed pos.	Percent of flocks classed negative	Percent of flocks classed positive
1929-30	22	13	9	59.1	40.9
1930-31	16	8	8	50.0	50.0
1931-32	28	20	8	71.5	28.5
1932-33	23	15	8	65.3	34.7
1933-34	8	7	1	87.5	12.5
1934-35	18	13	5	72.3	27.7
1935-36	41	33	8	80.5	19.5
1936-37	79	68	11	86.1	13.9

In only one case was a flock classed as negative as a result of the post-mortem examination of reacting birds and on the next test found positive. Two birds that reacted on the test of January 3, 1930 were autopsied and *S. pullorum* was not isolated. On October 13, 1930, 22 reactors were found; two of these birds were called in for autopsy and *S. pullorum* was isolated from both birds. This flock was not used for breeding; baby chicks were purchased from pullorum-clean sources; and on the test completed December 17, 1931, one bird gave a suspicious reaction and was autopsied. *S. pullorum* was not isolated from this bird and since that date not a suspicious or a positive reactor has been found in this flock. Testing history of this flock is as follows:

Date tested	Number of birds	Number of reactors
November 7, 1926	150	0
February 8, 1927	743	0
July 2, 1927	551	0
June 16, 1928	198	0
October 24, 1928	785	0
January 3, 1930	1,086	0
October 13, 1930	570	22
December 17, 1931	972	0
January 23, 1933	1,252	0
January 30, 1934	1,177	0
January 29, 1935	1,184	0
February 4, 1936	1,345	0
February 18, 1937	1,460	0

Pullorum-clean and pullorum-passed flocks tested during the 1936-1937 season that had reacting birds autopsied in previous years and found negative

Flock No.	Year of 1st non-reacting test	Dates that suspicious or positive reacting birds were autopsied and found negative		
1.	1925	July 2, 1929	April 4, 1934	March 24, 1936
2.	1926	Oct. 31, 1931	Nov. 15, 1934	Nov. 4, 1935
3.	1927	Nov. 12, 1930	Sept. 17, 1931	April 8, 1936
4.	1927	Nov. 16, 1932	Mar. 19, 1935	Nov. 16, 1935
5.	1925	Oct. 9, 1931	Dec. 7, 1935	
6.	1929	Nov. 8, 1935	Jan. 1, 1937	
7.	1929	Oct. 10, 1932	Dec. 21, 1934	
8.	1929	Oct. 29, 1929	Nov. 18, 1936	
9.	1929	Oct. 11, 1930	Sept. 3, 1936	
10.	1931	Nov. 18, 1931	Jan. 16, 1935	
11.	1931	Nov. 3, 1931	Jan. 25, 1936	
12.	1931	Dec. 8, 1931	Nov. 6, 1933	
13.	1933	Dec. 22, 1934	Jan. 10, 1936	
14.	1935	Jan. 27, 1935	Dec. 17, 1936	
15.	1926	Feb. 27, 1936		
16.	1927	Mar. 20, 1931		
17.	1930	Apr. 4, 1934		
18.	1931	June 18, 1932		
19.	1931	Sept. 22, 1931		
20.	1932	Jan. 15, 1933		
21.	1932	Dec. 5, 1932		
22.	1932	Sept. 26, 1934		
23.	1932	Sept. 25, 1935		
24.	1933	Dec. 12, 1934		

Flocks in the above table have been tested annually since the date of the first non-reacting test and are still classed as pullorum-clean or pullorum-passed.

Poultrymen who wish to maintain pullorum-clean or pullorum-passed flocks should observe the following:

1. A 100 percent test of all birds on farm or farms annually before the breeding season.
2. No hatching eggs used until after birds have been tested with no reactors found.
3. All eggs should be hatched in incubator or hatcheries in which only eggs of the same pullorum status are hatched.
4. All new stock added, should be from a flock of the same pullorum status or better. Such new stock should be either hatching eggs or baby chicks.
5. No custom hatching should be done unless all eggs are from flocks of the same pullorum status or better.
6. If mature breeding cockerels are added, they should be tested before they are allowed on the farm, and all such stock should be from flocks of the same pullorum status or better.

* N. H. U. S. Pullorum-Clean flocks: Two or more 100 percent tests, no reactors.
** N. H. U. S. Pullorum-Passed flocks: One 100 percent test, no reactors.

CONDUCTING A TRAINING SCHOOL ON PULLORUM DISEASE CONTROL

By A. J. Durant, chairman, Department of Veterinary Science,
University of Missouri, Columbia, Mo.

Training schools on pullorum-disease control have been held in Missouri for the past four years, in conjunction with the poultry short course. This training school was designed to give hatcherymen, their employees and others, instruction in the principles of selecting breeding flocks, and in the principles of pullorum-disease control.

The National Poultry Improvement Plan specifies "that the flock inspection agents for U. S. Approved flocks shall be required to take a course in standardbred and production judging prescribed by the college of agriculture, or other properly constituted State agencies and shall be required to pass an examination and be authorized by the official State agency to do flock-selection work." Furthermore, the national plan specifies that the U. S. Pullorum-Tested flocks "may be tested by a pullorum-testing agent who shall be required to take a course of training prescribed by the livestock sanitary authorities or officials of the State college of agriculture and shall be required to pass an examination and be authorized by the official State agency to do pullorum-testing work."

The methods and requirements of conducting such a school in any State depends upon the conditions existing in that particular State. In Missouri there are now 28 or more counties in which there is no veterinary service and Missouri is a State where little attention is given to poultry-disease matters by the veterinary profession. It appeared at the beginning of this program that the only practical means of getting the blood testing done to conform to the National Poultry Improvement Plan was to conduct a school in which hatcherymen and their employees could be trained to do blood-testing work. Only those qualifying in these courses would be issued permits.

As a further safeguard a deputy State veterinarian was appointed by the commissioner of agriculture and under the direction of the State veterinarian as an official State inspector of all hatcheries and individuals doing blood testing that were under the National Poultry Improvement Plan. This inspector's duties consisted in checking all the blood testers as to technique, methods of disinfection, disposal of reactors, sanitation in the hatcheries, and to inspect flocks by a check blood test to see if the flocks qualified for the class to which they were assigned. Any tester who failed in carrying out any phase of the program as outlined had his permit removed and was not allowed to do further testing.

In order to facilitate and balance the program on the culling and blood-testing school the entire group attending the short course is divided into two equal sections. While one section is taking the course in culling the other is occupied with the pullorum-disease testing school. These two divisions are designated as section 1 and 2 for the three-day short course. The two sections are alternated so that exactly the same instruction is given to each section during the three days of the course.

The pullorum-disease-testing instruction as conducted in Missouri is divided into two phases; first, instruction on fundamental information on pullorum disease, its nature and control, as well as information on other poultry diseases necessary in conjunction with the control of pullorum disease. The second phase consists of laboratory instruction on the fundamental technique of pullorum-disease testing by the rapid whole-blood method.

Special instruction is given, using a completely equipped individual testing block for each candidate. This testing block is illustrated by the large chart (a copy of which follows). At the top of the testing blocks are 5 shell vials containing oxalated blood which give from a negative to a 4 plus agglutination reaction. To the right of these vials is a bottle of antigen and below the antigen are two containers, one with water for cleaning the testing loops and the other a receptacle for the loops. These containers are set in holes bored in the block. In the lower left is a white glass plate, 4 by 5 inches, upon which the tests are run. In the lower right corner is a Bard Parker blade No. 11, which is used later in the course for obtaining blood from birds of unknown reaction.

The only additional equipment necessary then for running a series of tests to learn the technique and to observe various degrees of agglutination is a small clean towel or piece of gauze upon which to clean the loop between tests after rinsing in the water container. By means of the testing block each candidate can practice running the rapid whole-blood stained-antigen test for pullorum disease.

A study of the chart illustrating this block will clarify the various steps in the technique. It is important to place the antigen drop on the plate before the blood, since any delay in mixing blood and antigen may result in clotting, which might interfere with proper interpretation of the reaction.

Following the general instruction on pullorum disease and on the practice testing by means of oxalated blood and the testing block, the candidates are then permitted to test a group of birds whose blood reaction is known to ascertain for themselves in actual practice what may be expected from a designated reactor.

During the course series of 4 mimeographed sets of sheets are issued to the candidates for study and explanation of laboratory procedures: Series No. 1, entitled "Information Concerning Pullorum Disease"; Series No. 2, "Important Factors to be Considered When Running Tests for the Detection of Pullorum Disease"; Series No. 3, "Forty-four Questions on Pullorum Disease Testing, Rapid Whole Blood Method"; Series No. 4, "Illustration of Testing Block for the Rapid Whole Blood Test for Pullorum Disease." These sheets are designed to give the maximum amount of information for a course of this nature.

After all instruction has been given two separate examinations are held for each candidate, one consisting of a series of questions relating to the subject, the other a practical laboratory examination which consists of testing a group of birds. These birds have been recently checked for their reaction in the laboratory, both by the tube and the rapid whole-blood stained antigen test.

All candidates who pass a satisfactory examination in both phases of the course are issued certificates and a permit to do blood testing by means of the rapid whole-blood stained-antigen test.

This paper concerns principally those who are interested in running the rapid whole-blood stained-antigen test, but attention should be called to the fact that a little less than half the States in the United States at the present time use only the tube agglutination test. In Missouri both tests are used. A number of hatcheries in this State are using the tube agglutination test only. Some of these hatcheries have well equipped laboratories for running the tube test and are furnished an antigen ready for use by the Veterinary Department of the University of Missouri. These hatcheries run their own tests under our supervision. Other hatcherymen who are using the tube test are having their blood samples tested by the Veterinary Department of the University of Missouri. All hatcherymen conducting the tube test are given a special course of instruction in the Veterinary Department. The minimum time for this instruction is two weeks.

The tube agglutination test has been the standard in Missouri for many years, and the hatcheries using this test have had excellent livability of chicks. Since the inauguration of the wide use of the rapid whole-blood stained-antigen test, both of these methods of testing have been instrumental in greatly reducing the baby-chick mortality and the number of infected birds.

UNIVERSITY OF MISSOURI - POULTRY SHORT COURSE 1936

Series No. 1

INFORMATION CONCERNING PULLORUM DISEASE

Pullorum disease is one of the most serious diseases affecting poultry throughout the country.

The disease is caused by a small organism -- known as Bacterium pullorum * which is transmitted from generation to generation through the egg, or it may be spread thru the incubator, droppings and infected eggs. It is easily killed by common disinfectants. A solution of lye, one 13-ounce can to 12 gallons of cold water, is found to be very effective.

The disease in baby chicks is usually very fatal, while in adults it seldom causes death and is usually localized in the ovary, testicle, unabsorbed yolk, occasionally in bumblefoot and heart infection.

In baby chicks the organism is found throughout the body, all of the organs and the blood, and the only definite method of diagnosing pullorum disease in baby chicks is by cultural methods. However, a typical history of the disease is that the greatest losses occur from 7 to 9 days after hatching and very few chicks develop symptoms after the 14th day.

No drugs have been found that will cure or prevent pullorum disease in the body or egg, therefore, the solution of the problem lies in the removal of all the carriers. Due to this fact, one can see that all birds on the farm, including turkeys, ducks, geese, etc. should be tested the same as the chickens at the time of first test of the flock. Several tests a year will greatly lessen the infection. However, if only one test is made it should be as near as possible to the time for saving hatching eggs. Custom hatching from non-tested flocks should be conducted in separate buildings or at least in separate rooms. Incubators should be kept scrupulously clean. All egg materials should be scraped from the trays and sides of the incubator as well as removing all dust and lint before disinfection, and disinfect thoroughly following each hatch, using either formalin or formalin and potassium permanganate.

In using either formalin or formalin and potassium permanganate it is very important to have the air contain 60 percent of moisture and the temperature above 50 degrees Fahrenheit in the incubator room at the time of application.

The amount of formalin to be used is ten ounces for each 1000 cubic feet of space. In using formalin and potassium permanganate use one pint of formalin to one-half pound of potassium permanganate for each thousand cubic feet of space. Formaldehyde and potassium permanganate is to be used if the space is over 1,000 cubic feet.

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*Usually referred to as Salmonella pullorum.

For each 1000 cubic feet of space in both cases, either formalin or formalin and potassium permanganate, the incubators should be air tight and the disinfection continued for six to twelve hours between hatches, in order to be sure that all the germs of pullorum disease have been destroyed.

The incubator is a very important factor in the control of pullorum disease as one infected chick in an incubator can spread the disease to a large number of healthy chicks.

If pullorum disease occurs in a flock of chicks one can be reasonably sure of it by the typical death loss and also by finding hemorrhagic bands on the liver, unabsorbed yolks, swollen joints, swollen body due to fluid and abscessed lungs. The ultimate and final diagnosis should be from a competent laboratory.

If the chicks are free from pullorum disease they are not affected by chilling or over-heating unless carried to extreme, whereas in infected flocks either of the two conditions may cause disastrous results.

In adult birds the infection of pullorum disease is most commonly harbored in the ovary and the disease is perpetuated and transmitted through the egg from these carrier hens to the baby chick. For that reason it is very important to eliminate from farm flocks all hens which react to the agglutination test for pullorum disease.

Some of the reasons for removing infected hens are as follows:
First, the fertility is low.
Second, they will lay fewer eggs than healthy hens.
Third, on the average 71 percent of the chicks hatched from carrier hens will die with pullorum disease.
Fourth, thirty-three percent of eggs laid contain the germs of the disease, on the average.
Fifth, thirty percent of reactor hens die from some cause or other annually, whereas, the normal death rate in flocks is about twelve percent.
Sixth, the disease is spread slowly from carrier hens to healthy hens in flocks.

Almost any one of the reasons for disposing of carriers is sufficient to justify blood testing and removing all reactors from farm flocks.

The blood samples for running an agglutination test should be obtained by puncturing the wing vein on the under side with a sharp knife, thus very little bleeding will occur.

After each bird is bled the knife should be wiped clean on a piece of cotton dampened with a 5 percent solution of carbolic acid.

The antigen and blood should be mixed immediately so that the blood will not clot and cause confusion in reading the test. The test should not be read until two minutes have elapsed. These reactors should at once be placed in coops and disposed of as they are suitable for human food.

Large flocks of birds should be tested as carefully as if the owner had only a few birds on his farm. It is not possible to distinguish a reactor from a non-reactor merely by physical appearances.

If possible, moderate weather should be selected for testing. Birds may be starved before testing, that is, kept from feed the day they are tested until after the test.

The drops of blood and antigen should always be the same size when making a test in order to insure a more correct reading.

The antigen dropper should never touch the plate or blood, and in dispensing antigen should always be held at the same angle.

UNIVERSITY OF MISSOURI - POULTRY SHORT COURSE 1936

SERIES NO. 2.

IMPORTANT FACTORS TO BE CONSIDERED WHEN RUNNING TEST FOR THE DETECTION OF PULLORUM DISEASE CARRIERS

1. Antigen.
2. Condition of birds.
3. Confining birds for testing.
4. Taking the samples.
5. Mixing and rotating the test.
6. Reading the test.
7. Disposing of reactors.
8. Cleaning and disinfecting.

The first consideration is the antigen which should be procured from some reliable well-established producer of antigen. This antigen should be field tested on known negative and positive birds before use. These negative and positive birds should be held by the hatcherymen so that he can check each new bottle of antigen before taking it out into the field to use on his cooperators' flocks.

All birds should be in perfect condition when they are tested. If one tests a flock in which there are intercurrent diseases such as fowl pox, tracheitis, cholera or roup, negative birds may show a weak reaction to the test; whereas if the test is delayed several weeks and the condition clears up, a much more reliable test can be made. If the birds have tracheitis or fowl pox or cholera it is very easy to transfer this disease from one bird to another or to another cooperator's farm.

The birds should be confined the night before they are expected to be tested and the cooperator should assist with handling the birds so that they are not frightened, as oftentimes when birds are once frightened, egg production is materially lessened. After the birds are once confined in a small pen or catching coop, they may be tested one at a time or on a rack or in a series of trap nests. Anyone of these methods is very satisfactory. Probably the trap nest scheme is one of the best as the birds cannot flop and injure themselves or get loose from their fastenings.

In taking the samples, one should use a sharp knife or some other instrument where a good flow of blood can be obtained and yet not large enough to cause a bad hemorrhage. For this particular purpose we recommend the Bard-Parker blade No. 11 as we have used it for several years and have found it to be quite satisfactory. The sample should be drawn from the under side of the wing near the elbow joint. Merely remove a few feathers and make a sharp, quick puncture in the same direction as the vein is laid down in the wing. Do not cut the vein crosswise or a profuse hemorrhage may occur. The blade should then be wiped on a piece of cotton made damp with a 5% phenol solution. The blood may be transferred to the plate by means of a small wire loop which is usually furnished with the antigen. One should be careful not to get any scales or cells from the skin of the bird as this may lead to confusion in the diagnosis of that particular sample.

The antigen drop and the drop of blood should always be as near uniform as possible, that is, there should be no air in the dropper and if the loop is thoroughly cleansed after taking each sample of blood it will always carry the correct amount of blood. After the drop of blood and antigen have been put on the plate they should be mixed with the wire loop immediately so that the blood will not clot. The mixture should be spread over an area not larger than a ten cent piece. After two minutes a reading may be made.

The readings are made either reactors or non-reactors. The reacting birds will clump the bacteria in the antigen while in the non-reactors the antigen will remain the same as when it was put on the plate. Birds showing a very slight clumping should be removed as they may be and probably are, very weak reactors. These are as dangerous as the birds showing a quick and definite clumping of the antigen.

The birds which react to the test should be immediately cooped and sold. If they are allowed to remain on the farm they will spread the disease back to the non-reactor birds either by the birds becoming mixed or by the attendant carrying the germs from one group to another.

After all of the reactors are removed from the flock the house should be thoroughly cleaned mechanically with a hoe or other sharp instrument to remove all droppings and litter that may adhere to the walls, roost-poles and floors. The drinking fountains and feeders should be thoroughly cleaned, after which the house and utensils should be sprayed or mopped with a solution of lye water, using one can (13 ounces) of lye to 12 gallons of cold water, and the yards, at least closely adjacent to the house should be plowed with a turn plow. It should then be sown to some cover crop that will keep the birds off the ground as much as possible.

One should impress upon the cooperator the necessity of thorough cleanliness and sanitation throughout the year and especially following each test, as dirty yards and houses are a source of infection for healthy birds.

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SERIES NO. 3.

QUESTIONS ON PULLORUM DISEASE TESTING

RAPID WHOLE BLOOD METHOD

1. What is the name of the organism causing pullorum disease?
2. What is the accepted term now used instead of the old name, bacillary white diarrhea?
3. Is S. pullorum found in the blood of infected baby chicks?
4. Is S. pullorum found in the blood of infected adults?
5. Do infected chicks react to the test for pullorum disease?
6. Why do infected adults react to the test for pullorum disease?
7. Does a strong reactor indicate that a hen is badly infected?
8. What breeds of chickens show the greatest percent reactors?
9. What breeds of chickens show the smallest percent reactors?
10. How is S. pullorum spread in the adult flock?
11. How is S. pullorum spread in baby chicks?
12. Is S. pullorum resistant to ordinary disinfectants?
13. What is the cheapest and yet a very efficient disinfectant to use to kill S. pullorum?
14. Name the organs in which evidences of the disease may be found upon autopsy in baby chicks.
15. Name the organs in which evidences of the disease may be found upon autopsy of adults.
16. Should all male birds be tested?
17. What is the most reliable test used for detecting reactors?
18. Name the two best methods that are used for detection of S. pullorum carriers.
19. Give the length of time to detect a reactor by (a) Rapid test, (b) Tube test.
20. Give five reasons for disposing of reactors.
21. Are reactors suitable for human food?
22. Are birds other than chickens found to be affected with S. pullorum?
23. Is it advisable to test birds of all kinds on the farm?
24. Is any ordinary wire fence between negatives and reactors sufficient to prevent the spread of S. pullorum?
25. How does the death rate run in a flock of infected baby chicks? Give the days when the highest death rate usually occurs.
26. Is S. pullorum fatal to all chicks affected?
27. Does an infected hen lay as many eggs as a non-reactor?
28. Is field work in the rapid whole blood test a quicker test than the tube agglutination test when considering a large group of birds?
29. What is the cost of running the rapid whole blood test and the tube agglutination test?
30. Is the antigen an important factor in the test?
31. Is all rapid test antigen suitable for testing a flock?
32. How should the incubator be cleaned and disinfected to retard the spread of S. pullorum?
33. Describe in detail the modern method of fumigating an incubator with potassium permanganate and formalin, and formalin alone.
34. Is the incubator an important factor in pullorum disease eradication?

SERIES NO. 3. (continued)

35. Is there danger of the attendant in the care of incubators spreading pullorum disease from the custom hatching room and incubator to the main incubator room and chicks?
36. Do chicks hatched from blood-tested flocks die as readily when subject to over-heating or chilling as chicks from flocks which have not been blood-tested?
37. What should be done to get rid of infection on the farm after a blood test?
38. Is it practical to use disinfectants on a poultry yard?
39. Is it possible to detect pullorum disease carriers when culling the flock?
40. Give a simple method for confining birds while being tested.
41. Is it necessary to starve the birds before testing?
42. Is the rapid test reliable on extremely hot days?
43. Why should the blood and antigen be mixed immediately?
44. Does the size of the drop of blood greatly influence the test?

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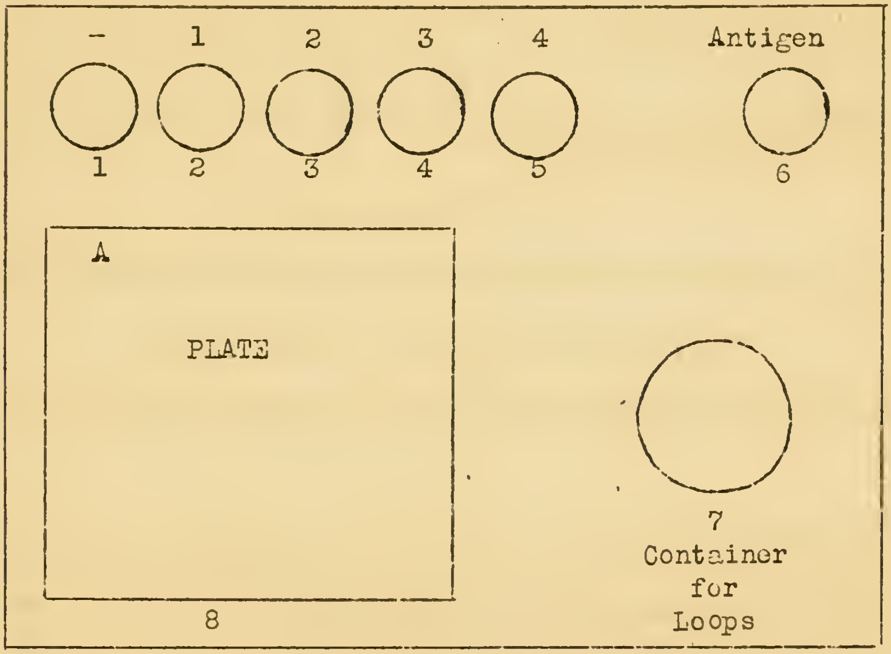
SERIES NO. 4.

ILLUSTRATION OF TESTING BLOCK FOR THE RAPID WHOLE BLOOD TEST FOR PULLORUM DISEASE



1. Negative oxalated blood
2. Weak positive oxalated blood
5. Strong positive oxalated blood
3 and 4. Gradation of positive oxalated blood
6. Antigen
7. Container for loops
8. Plate

I. Read each test at the end of 2 minutes.
II. The loop must contain the same amount of blood for each test. It should be full but not bulging.
III. The antigen dropper should be held perpendicular for each sample since different angles vary the size of the drop.

The oxalated blood of different titres when mixed with antigen shows various reactions from negative to strong positive. This is to familiarize students with the negative reaction as well as birds that show a very weak or a very strong reaction.

BE SURE THE PLATE IS FREE FROM DUST OR FOREIGN MATERIAL

In testing each sample of blood a drop of antigen is put on the plate in position A. and a full loop of blood from sample 1 is thoroughly mixed with antigen. The loop should be washed in a cup of water (7) and dried on a cloth before another sample is tested. The mixture should not be spread larger than the diameter of a ten cent piece. The plate may then be gently rotated, which often facilitates the detection of weak reactors. This particular sample (No. 1) will not show a clumping or agglutination of the organisms in the antigen. It is therefore designated as a non-reactor or negative sample.

Samples 2, 3, 4 and 5 should be tested, using the same technic, and observations of the reactions from left to right will show the difference between a negative or non-reactors on the left and the four positives or reactors on the right.

It is very important to read these directions several times before testing the samples so that the exact procedure can be quickly and definitely followed through and in testing each sample always use the same amount of blood and antigen and read the sample at the end of 2 minutes.

PLEASE WASH THE PLATE AND DRY WITH A CLOTH AFTER THE SAMPLES ARE TESTED AT EACH LABORATORY PERIOD.

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OFFICIAL APPROVAL OF STAINED ANTIGEN AND INTERPRETING THE RESULTS

By Jacob M. Schaffer, senior chemist,

Bureau of Animal Industry, U. S. Department of Agriculture.

The National Poultry Improvement Plan specifies that "The stained antigen used in the whole-blood testing for pullorum disease shall be approved by the U. S. Department of Agriculture." Since October 5, 1935 the Department has taken measures to enforce this provision of the plan. The system of antigen control which has been developed is possible because the process of preparing the stained antigen was patented and the ownership of the patent is vested in The Secretary of Agriculture of the United States.

About 8 years ago a whole-blood test for pullorum disease was first reported by Bunyea, Hall, and Dorset. In spite of certain weaknesses in the antigen employed, in that it was inadequately preserved, that it contained live pullorum organisms, -- a distinct disadvantage when tests were made on farms,-- and that more experimental work was required, it was immediately exploited by some commercial concerns, to the great embarrassment of the original investigators. Since the product was not to be fed or injected into animals, its control did not come under the Food and Drugs Act or the Virus-Serum-Toxin Act, and the problem arose of how to protect the public. Later, when the method was improved and the stained antigen was developed, it was decided by Dr. Dorset, who was deeply concerned in the matter, that in the public interest a patent covering the stained antigen should be applied for. The patent was subsequently granted.

A patent gives the owner the right to exclude others from making, using or selling the invention, throughout the United States for a period of 17 years. The owner of the patent can issue licenses by suitable agreement with those parties whom he chooses. In such event he can stipulate many conditions, such as payment of royalties, control of the product, mode of advertising, extent of commercialization, etc. He can issue as many non-exclusive licenses as he sees fit. In other words, he has wide latitude for control.

The system of antigen control set up under this patent in the Department operates as follows:

Application for permission to produce the stained antigen is made to the Secretary of Agriculture. In his request the applicant must indicate that he is a responsible party, that suitable laboratory quarters and equipment will be provided and that production of the antigen will be carried out only by a trained bacteriologist or under his immediate supervision in accordance with whatever rules may be prescribed by the Secretary. If the application is satisfactory a revocable licensing agreement is signed by the Secretary.

The prescribed "rules" give in detail the procedure to be followed by the producer in the preparation, labeling, and advertising of the antigen. It describes the culture medium, the strains of Salmonella pullorum, the growing of the cultures, the preparation of the antigen, the testing of antigen for purity and sensitivity, the claims that may or may not be made on labels or in advertising. It provides for the keeping of records and makes provision for acceptance of such changes in the rules as may be from time to time required by the Bureau.

Thirty-two firms and institutions have been granted permission to produce the pullorum-disease stained antigen, though not all are active at present.

Supplementing the original rules the Bureau makes the following requirements of each establishment producing or distributing the antigen:

1. Samples of all bottles, cartons, labels, wrappers, circulars, droppers, and wire loops, and all other accessories to accompany the product as marketed, shall be submitted by each producer and distributor for approval

2. Each producer shall submit for approval a sample of not less than 10 cc of each lot or batch of the product, identified by a serial number. Each such sample shall be accompanied by a production record including, in detail, all processes and ingredients involved in the manufacture of the batch, the date of its completion, and its total volume.

3. Each producer who supplies the product to a distributor for marketing under a different name or brand shall transmit a copy of the invoice covering each shipment to said distributor.

Every sample of antigen that is received is examined for sterility, sensitivity, bacterial density, formalin content, and dye content. The labels and literature are scrutinized for misstatements. The volume of antigen is measured to ascertain whether it corresponds with the volume or the number of tests claimed on the label. The volume of the drop delivered by the dropper, which the package may contain, is measured to determine whether it corresponds to the required 0.05 cc which was the size of the drop recommended in the original publication of the Bureau investigators. The volume delivered by the wire loop is measured to determine whether it delivers between 0.02 and 0.03 cc. The record of production is studied for departures from the prescribed method.

When the examination is complete the producer is notified that the items submitted are passed without criticism, or if faulty, they are criticized. In case the antigen is found to be faulty the producer is required to withhold or withdraw that batch from the market. In many cases the fault is a technical one which may easily be remedied and the producer is advised how to reprocess the batch if he wishes to do so. He is then required to submit a new sample with the required records for a new examination.

During the 12 months preceding May 1, 1937, 424 samples of antigen were submitted; 358 were passed and 66 were rejected. This represented a total volume of 1,400,000 cc of stained antigen passed, sufficient to make 28,000,000 tests, and 200,000 cc of antigen rejected.

In order to assure that samples of all stained antigen distributed in the field have been submitted by their producers to the Bureau of Animal Industry in due form, a request was made (Circular Letter 1989) to official State agencies in charge of pullorum-disease control to transmit from time to time a list of the brands of stained antigen being used for official testing in their respective States. The list should include the name of the manufacturer or distributor and the serial number which is borne on the label as identification of each separate lot or batch of the product.

In addition, in order further to assure the reliability of the product actually used in the field, Circular Letter 1989 stated that the Bureau would be glad to test such samples of stained antigen as might be sent by State agencies. It is highly desirable that these samples should be transmitted in original unopened containers and be accompanied by all labels, accessories and advertising matter supplied therewith by the producer or distributor. However, tests can be made on subsamples comprising not less than five cubic centimeters. Such subsamples should be accompanied by either the original label or an accurate and complete copy thereof. The samples with letters of transmittal should be addressed to the Bureau of Animal Industry (Antigen Control), Washington, D. C.

Naturally, in addition to the use of a reliable antigen, a satisfactory technique is essential. In performing the test a number of factors have been found to influence the results; for instance, the proportion of blood and antigen employed, the method of mixing the blood and antigen, the temperature at which the reaction is carried out, the rate at which the reaction mixture is allowed to dry, the elapsed time before readings are made, as well as the sensitivity of the antigen. Our experience has emphasized the need for following closely a definite technique. The method we use when testing commercial antigens is the loop method essentially as described by Schaffer, MacDonald, Bunyea, and Hall in the Journal of the American Veterinary Medical Association, August, 1931. A drop of stained antigen is placed on a glass plate, a loopful of fresh blood is stirred into the antigen at the same time the mixture is spread to a diameter of about one inch, and the plate is gently tilted back and forth once or twice to induce a rotating flow of the smear. It is then set down and the next test is made in the same manner on the plate. In this fashion a test smear will have been rotated about 4 times within a two-minute interval when the final reading is made. An experienced worker may be able to classify the reaction and make his judgment in less than two minutes. A positive reaction consists of well-developed violet clumps surrounded by clear spaces. We regard as definitely positive those reactions in which the appearance of the well-defined clumps takes place within one minute after mixing the blood and antigen, the temperature being between 65° and 100° Fahrenheit. In cold weather some means for warming the plate is necessary. Those reactions in which the clumps appear more slowly, between one and two minutes, are classed as suspicious. The interpretation of these should be the same as of partial or incomplete agglutination reactions in the tube method of test. To safeguard the flock, such fowls should be removed. The granular appearance which may show up after two minutes is classed as a negative reaction.

Logically, the technique employed in practical testing in the field ought to be, as nearly as practicable, identical with that used in the laboratory as a basis for approval or rejection of producers' samples. At all events, departure from that technique can be justifiable only after adequate investigation has demonstrated that no sacrifice in accuracy results.

APPLYING MORE EFFECTIVELY THE PULLORUM-DISEASE-CONTROL FEATURES OF THE NATIONAL POULTRY IMPROVEMENT PLAN

By Hubert Bunyea, veterinarian,
Bureau of Animal Industry, U. S.
Department of Agriculture.

Although definite statistics are not available as to the annual losses suffered by the poultry industry as a result of pullorum disease (bacillary white diarrhea) in this country, it is known that the disease is quite widespread, existing in every locality where appreciable numbers of poultry are kept. It would be impossible to estimate the cost of this disease to the industry in the deaths of baby chicks alone, not to mention the havoc wrought by the infection in diminished egg production in hens and pullets, reduced hatchability of eggs, and occasionally the deaths of hens due to generalized pullorum infection.

The disease is caused by a toxin-forming germ which is known as Salmonella pullorum. Although this germ is quite easily destroyed it has been known to remain alive in soil or manure in sheltered places for many days, or even for months. The primary seat of pullorum disease is in the ovary or pericardium of the infected hen and occasionally in the pericardium or testicles of roosters. The disease is commonly transmitted from the hen to the chick by means of the egg. Of course, it is not every hen that is affected, and not every egg laid by an infected, or "carrier" hen contains the germ. It is also possible that diseased roosters may transmit pullorum infection to the egg. Infected eggs, if hatched, are very likely to produce chicks that are infected with pullorum disease. Such chicks may die of the disease any time in the first few weeks of their lives, or unfortunately they may survive to maturity and repeat the cycle, themselves producing pullorum-infected eggs and pullorum-diseased chicks. Baby chicks having the disease are constantly voiding enormous numbers of the germs in their droppings, thereby spreading the infection to their tiny associates.

The disease has existed for many years in the United States. Its economic importance, however, has assumed increased magnitude because of the recent colossal development of the hatching industry. Science has shown that pullorum disease is capable of spreading from infected chicks to healthy chicks in all of the various types of incubators in common use, when some of the eggs hatched are from infected parent stock. This is likewise true of chicks hatched under hens.

Through the hatchery, however, with its wide territory of distribution, this disease may be disseminated over large areas and work untold injury to the poultry industry. This places a responsibility upon the hatcheryman, which he has not been slow to recognize, and concerning which there is much that he can do and has done both to conserve the stability of his own enterprise, and to enhance the best interests of the poultry industry upon which his success depends.

It is obvious, however, that the problem of controlling pullorum disease is not primarily an incubator problem, but one of flock hygiene, and that its solution, in the main, depends not upon special appliances or procedures in the hatching of eggs or brooding of chicks, but rather upon the successful diagnosis of the disease in carrier adults, so that such adults may be eliminated or excluded from breeding flocks.

Pullorum disease is the only disease of poultry that is specifically named in the National Poultry Improvement Plan, and the only one for which the plan provides specific control measures. This audience is no doubt quite familiar with the details of the pullorum-disease-control features of the plan, so that it will not be necessary to take the time to review them now.

Suffice it to say here that the basis of pullorum-disease control under the plan lies in the identification of carriers of the disease by means of the agglutination test, and their prompt removal, not only from the flock, but from the premises of the participating poultryman.

A year ago Dr. D. E. Madsen, of the Utah Agricultural College, Logan, Utah, presented before this body a comprehensive report, based on actual field observations of the methods of pullorum testing used in several States operating under the National Poultry Improvement Plan. In that report Dr. Madsen called attention to numerous practices and types of equipment being employed which were at variance with the accepted standards of the plan, particularly as regards the stained-antigen rapid whole-blood test. The main points discussed in that paper were:

Testing capacity of organization,
Necessity for careful handling of fowls,
Control of dust while testing,
Methods and equipment for obtaining blood,
Blood-measuring devices,
Types of testing plates,
Methods of warming the testing plate,
Methods of illuminating the test, and
Holding apparatus for birds under test.

Dr. Madsen also called attention to the need for closer official supervision over field testing for pullorum disease under the national plan, and the exercise of greater care, system, and efficiency on the part of individual testers, in addition to their thorough training in the technique of the work.

In view of the predominant proportion of pullorum-tested flocks over the other and higher classes, it would obviously be difficult to have this voluminous class of testing done in all cases by officially employed operators. Therefore, under the present set-up of the plan the "pullorum-testing agent," having received the training and authority given him by the official State agency to do the work, is in a position to serve the cause well by filling in the breach. However, it behooves the State agency, who must assume the responsibility for the accuracy of pullorum-testing agents' work, to provide adequate training for these men before giving them recognition, and then to restrain them from extending their activities into the-- to them -- forbidden fields of the pullorum-passed and pullorum-clean grades.

Doubtless some members of this body can see where improvements can be made in their method of training pullorum-testing agents, in the light of the very helpful and instructive address given by Dr. Durant today. It has become quite evident that there are in operation some variations from the accepted standards of equipment and procedure adopted for the pullorum-control phase of the plan. These standards, insofar as they pertained to the technique of blood testing, were included in the discussion presented before this body by the writer last year under the title "The technique of the three officially approved pullorum testing methods." That report is published in abstract in the proceedings of the conference for 1936.

In both of the papers cited there has been offered a workable definition of the essential testing equipment for the rapid test. The blood should be collected from the bird with the aid of some device for measuring the quantity desired. It has been found that a 24-gauge wire with a 3/16 inch loop at the end will deliver the right amount of blood. The correct quantity of antigen with which this loopful of blood is mixed is 1/20 of a cubic centimeter, and the dropper used should be calibrated to deliver this amount. The blood and antigen are mixed on the surface of a plate of glass with a white background, a pill-tile or a sheet of white porcelain. Paper test sheets are in use in some States, but Madsen has already called attention to their disadvantage of expanding at the point of moisture contact, thus leaving a wrinkled uneven surface, so that the test mixture runs to the valleys between the ridges and does not permit a level surface for even distribution of the test mixture. It would seem to the writer imperative that the test should be performed on a surface that is clean, rigid, hard, nonporous, smooth and either white, or transparent with a white background. With some possible reservations, considerable latitude would exist in the selection or preparation of suitable test equipment such as test plates, testing boxes, illuminating devices, and warming methods for test plates suitable for use within the meaning of the plan.

Serious discrepancy in the time interval of reaction exists among some of the participating States in which the stained antigen rapid whole-blood test is employed as the diagnostic test for pullorum disease: According to their respective reports the following time is allowed for stained antigen whole blood reactions to occur:

Variation in time interval of reactions

Time	States observing
2 to 3 minutes	1
3 to 5 "	3
"at least 2 "	1
10 to 15 "	1
"several" "	1
1 to 7 "	1
1 "	1
"varied according to antigen"	1
"before dry"	1
4 to 6 minutes	1
3 "	3
5 "	2
2 "	3
1 to 2 "	1
approximately 1 "	1

Thus it is seen that definite test intervals of from 1 to 15 minutes, and almost anything in between, are allowed in various participating States. Such variations cannot help but produce lack of uniform results. The literature embraced in the plan specifies a maximum test interval of 2 minutes. If the plate is slightly warmed in cold climates, this time is sufficient. In mild weather two minutes is usually longer than necessary. Frequently one minute or less is sufficient, but if the test be concluded at the expiration of the first minute, some reactors may be overlooked. No State agency, having subscribed to the pullorum-control provisions of the National Poultry Improvement Plan, should undertake to introduce changes in the details of the recognized testing methods in this or any other particular

What has been said for the rapid test applies with equal force to the laboratory tube test: Departures from the rule should be strictly avoide The present state of refinement of the tube agglutination test for pullorum disease must be safeguarded against deviations of technique or interpretation The standards for this test as adopted in 1932 by the U.S. Live Stock Sanitar Association have been agreed upon as part of the National Poultry Improvement

Plan. And yet the records show a degree of diversity in the matter of diagnostic serum-antigen dilutions that is certain to contribute confusion of results. The variations reported are as follows:

Variations in serum-antigen dilutions in tube test

Dilution	States using
1 - 50	3
1-25 and 1-50	2
1 - 25	5
1 - 40	1
1 - 100	1

Over against this array of self-assumed "local options" stands the definite and unmistakable specifications of the standard tube method:

"Serum Dilutions, Incubation, etc. Either of two dilutions of the test sera may be employed, namely 1:25 or 1:50. The 1:25 dilution, when used, shall serve as a finding dilution, and shall not be used to condemn a flock which has been placed on a ...(pullorum-clean) list, or the immediate progeny of a ...(pullorum-clean) flock, unless at autopsy the organism is found, or there is complete agglutination in dilutions of at least 1:50. In all official reports on the blood test the serum dilutions shall be indicated. The sera are introduced into the agglutination tubes in the desired amounts with well-cleaned serological pipettes or special serum delivery devices which do not permit of the mixing of different sera. The antigen and serum are well mixed before incubation.

"Incubation shall be at 37° C. for 24 hours when 1:25 dilution is used, and for 48 hours when 1:50 is employed: At the end of this period readings are made and recorded. Tubes showing doubtful or suspicious reactions are held at ordinary room temperature for an additional 24 hours and a second and final reading made on them. Any departure from this procedure shall be clearly stated in the reports."

It would seem to the writer that each State agency could accomplish much for pullorum control by accepting to a larger extent the task of educating the poultry owners along the lines of the program, and exerting good salesmanship in trying to line them up with the plan. To be sure, the plan is a voluntary proposition, but so also is the purchase of an automobile or a life insurance policy, or a set of encyclopedias, but it often takes good salesmanship to put the deal across. So the duty of those administering the plan does not stop with the participating hatcheryman and flock owner, but includes also a patient and persistent mission to the man on the outside, to try to enlist him in the program, and having succeeded in this, to guide and encourage him in the critical times when problems arise and difficulties and set-backs are encountered.

The following paragraph was written by the speaker in 1926:

"Any participation of the Federal Bureau in a comprehensive campaign against bacillary white diarrhea must be limited to an advisory or supervisory capacity. In fact, several prerequisites would appear to be imperative before the Bureau could hope to function adequately even to that limited extent. One of the conditions referred to is the necessity of a better unified organization within each of the State agencies cooperating in the plan in question. Complex or conflicting State machinery would tend to impede the best interests of joint action on the part of State and Federal governments. Therefore the State arm of the movement should be singled down to one official branch, whether that be the State veterinarian, State college of agriculture, or livestock sanitary board, etc., as the case might be. That branch should be responsible for the application of the agglutination test for bacillary white diarrhea, and its interpretation."

Your speaker would not make any present-day application of these words penned almost 11 years ago, but would prefer to commit them to the thoughtful consideration of State agencies in any State where it has seemed difficult to get together on a program for pullorum-disease control. The old adage is still true - "half a loaf is better than no bread," and a conciliatory program of pullorum control, with a few concessions made this way and that, is far better than none at all, and perhaps even best of all. Let each State agency from time to time review the specific measures laid down for the pullorum-control program as being worked out in his State, and if found needed, strive toward a more uniform standardization of pullorum-control technique throughout his organization. Concerted efforts of this nature on the part of those, in each of the several States, who are responsible for the proper execution of the pullorum-control provisions of the National Poultry Improvement Plan, will go far toward establishing a standardized technique throughout the industry, and will contribute toward a noteworthy achievement in safeguarding the hatchability and livability of the American chick.

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